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JANUARY 1926

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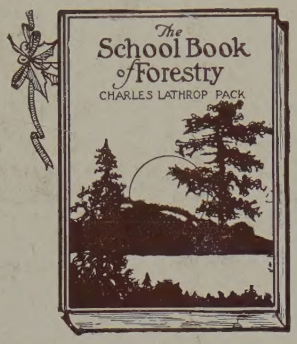

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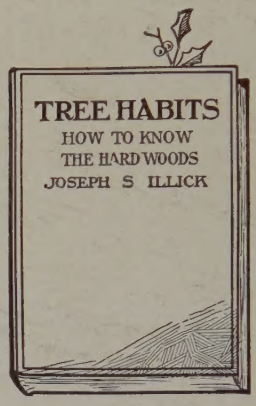

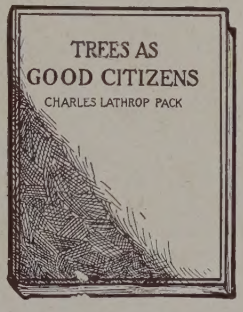

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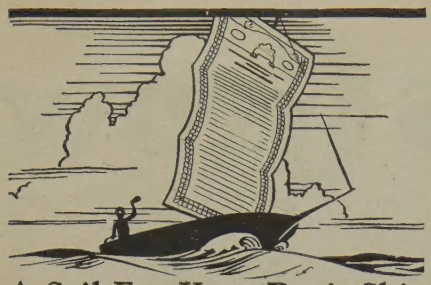

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Southwestern Birds

In the preparation of *The Field Book of Birds of the Southwestern United States,* published by Houghton Mifflin Company, two writers who have the viewpoint of the beginner in bird study, coupled with the proper background of ornithological knowledge, have cooperated with happy result. The authors are Luther E. Wyman, of the Los Angeles Museum, and Elizabeth F. Burnell, of the Nature Study Department of the Los Angeles schools. The territory covered in this book includes all of Arizona and that part of Nevada and California lying south of a line drawn from extreme northwestern Arizona, west and south through the mountain barrier fringing the southern end of the great central valley of California, to the ocean. It is illustrated by line drawings of most of the species together with a map showing its range. It is a practical field book.

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Florida Once More

It is impossible to keep Florida out of the public prints, and the public mind. Now come the trees of the boom state in the form of a booklet on the *Common Trees of Florida,* written by W. R. Mattoon of the United States Forest Service and published by the Florida Forestry Association. A limited number have been made available for free distribution through the Forest Service, Washington, D. C.

Oregon Is Fortunate

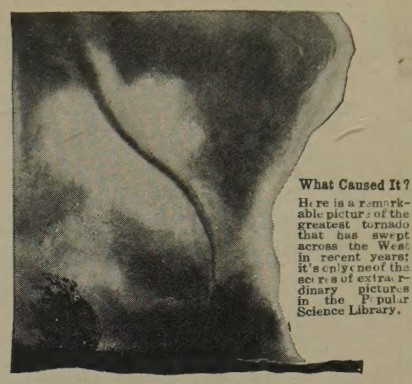
Attractively printed and admirably edited, as well as dedicated to a sound and constructive wild life viewpoint, *The Oregon Sportsman* is a publication of which Oregonians may well be proud. It is published bi-monthly by the Oregon State Game Commission under the editorship of E. F. Averill, who is likewise secretary of the commission and state game warden. William L. Finley, of the Staff of NATURE MAGAZINE, is one of the commissioners and a contributor to the publication. Ben Hur Lampman, whose delightful stores are well-known to the readers of NATURE MAGAZINE, enlivens the pages of this publication, also.

Northwest Sportsman

Not to be outdone by neighbors to the south in Oregon, the Washington State Sportsmen's Association and Affiliated Clubs are sponsoring a new publication in the *Northwest Sportsman.* It is under the editorship of Clinton W. Rowley and will cover the outdoor field from several angles.

Vive the Murrelet

Clad though it may be in a form of bound mimeographed sheets, *The Murrelet* is, nevertheless, a welcome periodical to many naturalists. It is the official organ of the Pacific Northwest Bird and Mammal Society, and is published for this organization by the State Museum of the University of Washington. It is published every four months under the combined editorship of F. S. Hall and J. Hooper Bowles and is now entering its seventh volume. Free to all members of the society, this publication is available by subscription at $1.25 a year—a worth-while expenditure for any serious student of Nature.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Nature Calendar

JANUARY

"There blooms no bud in May,
Can for its white compare
With snow at break of day,
On fields forlorn and gray.

"For shadow it hath rose,
Azure and amethyst.
And every air that blows
Dies out in beauteous mist.

"It hangs the frozen bough
With flowers on which the night
Wheeling her darkness through
Scatters a starry light."

WALTER DE LA MARE.

Beneath the snow the leaves of the heal-all are green all winter so that when spring comes they are prepared to start work immediately.

Do you know that within the beautiful buds you see all about you in the woods are embryo shoots? Some buds contain both flowers and leaves, others just flowers. Open a few and see for yourself.

The black birch, with its staminate catkins almost an inch long, its shiny brown trunk and its satiny twigs of golden brown, seems more beautiful than at any other time.

The water stored in the buds, trunk, and cambium of trees in winter freezes just as solid as that outside but intercellular spaces allow ample room for the icy crystals to expand and so no harm is done the trees.

The twigs of the red-osier dogwood gleam scarlet along woodland borders.

Have you noticed how like alligator-skin is the gray checkered bark of the flowering dogwood?

Orioles like to hang their nests in the elms. You may see some deserted nests now swinging from the high outer limbs of these trees.

If you know where some pigweed grows, visit it in your daily tramp afield and listen to the contented twitter of sparrows and juncos as they feed on this plant's abundance of seeds.

The dinner of the ruffed grouse is now confined mostly to buds and seeds. Sometimes berries and catkins may be added.

Some probable bird visitors who come down from northern lands in search of food are snow buntings, snowy owls, redpolls, siskins, and evening grosbeaks.

That bird you see which dips and floats in flight is either a goldfinch or a pine siskin. If it is grayish-brown with a wash of yellow on back, wings and tail, it probably is a siskin.

Ridges in the snow crossing the meadows show where shrews have tunneled in search of food. They have enormous appetites and since they do not store away supplies for the winter they must hunt with extra dilligence in order to secure enough to keep them alive.

Bats which have not migrated south are wintering in tree hollows, or under the rafters of barns or old buildings, or in caves.

Winter toboganning is at its height in otter-land. With forefeet bent backward the animals slide down the snow ridges on their bellies. Sliding not only is a sport for them but when portaging overland between streams they make it a part of their transportation scheme.

Winter as well as summer has its own beauties. An early morning walk along a woodland stream, after a cold night, reveals the wonders wrought by the Ice King. Each riffle and cascade has put on a disguise of enchantment, while on the banks bloom countless scrolls of frost-flowers.

Flocks of Bob-whites, each the survivor of one or two broods which have braved the dangers of autumn, gather to sleep each night in close-clustered circles.

Go out for a tramp the morning after a new snow and see the records left by rabbits, squirrels, meadow-mice, foxes and other wild creatures. They each tell an interesting story.

The squirrel uses his tail as a sort of blanket to keep him warm when he sleeps.

When snow covers the fields, meadow-mice are easier prey for hawks and owls. The white-foot is less conspicuous in color and therefore has better chances for being unnoticed.

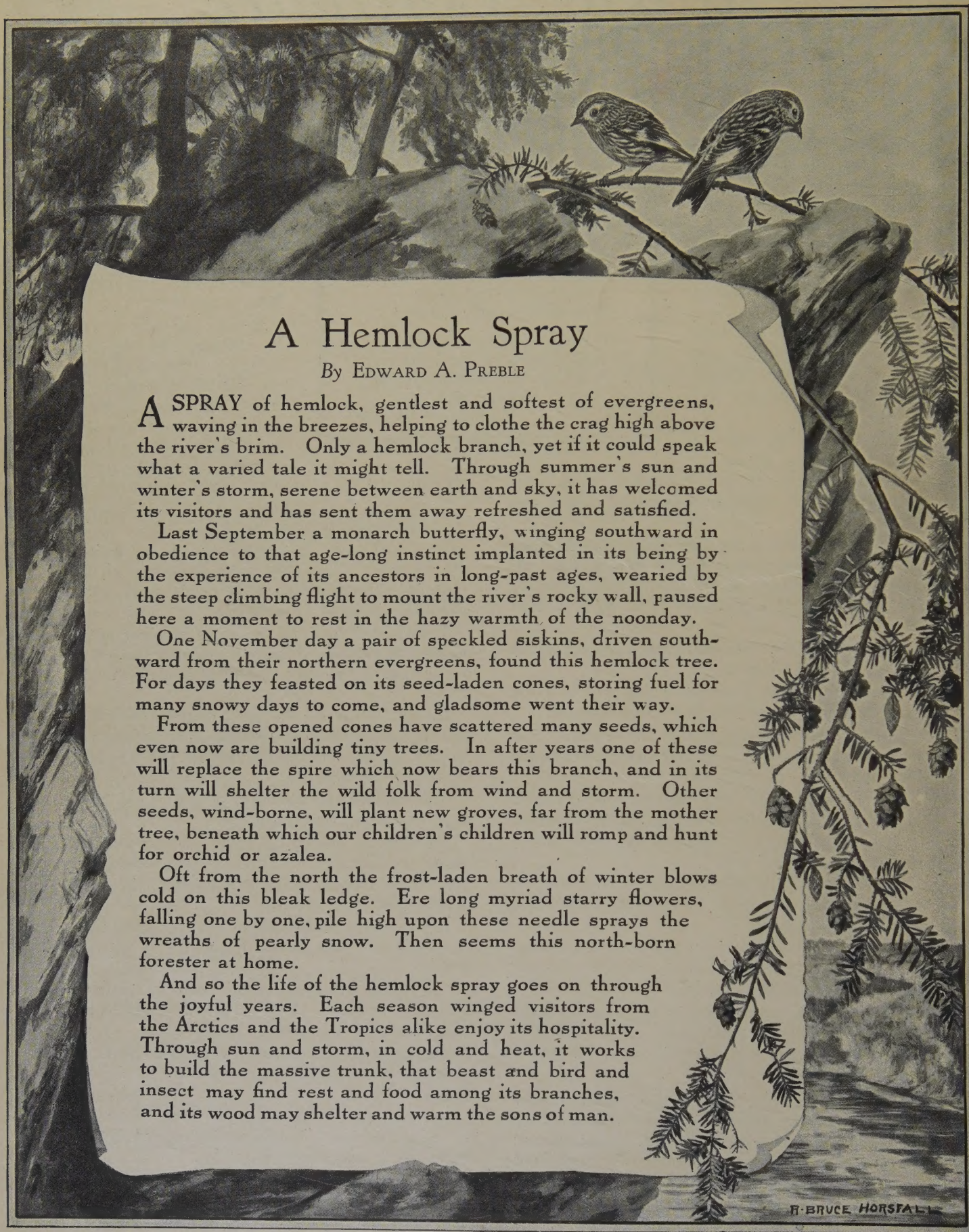
If you desire brilliance and heat for winter evenings around your hearth burn logs of seasoned hickory.

The moose now keeps to the shelter of the woods where he feeds on the twigs of birch, willow and such shrubs and the bark of certain trees.

The small swollen portions in the stems of the old dried golden-rod in the field are probably the winter homes of insects.

In your winter star study have you noticed the colors of the stars? Betelgeuse is deep red, Rigel is bluish-white, and Capella is yellow.

Prepared for NATURE MAGAZINE by the Cleveland Museum of Natural History



A Hemlock Spray

By Edward A. Preble

A SPRAY of hemlock, gentlest and softest of evergreens, waving in the breezes, helping to clothe the crag high above the river's brim. Only a hemlock branch, yet if it could speak what a varied tale it might tell. Through summer's sun and winter's storm, serene between earth and sky, it has welcomed its visitors and has sent them away refreshed and satisfied.

Last September a monarch butterfly, winging southward in obedience to that age-long instinct implanted in its being by the experience of its ancestors in long-past ages, wearied by the steep climbing flight to mount the river's rocky wall, paused here a moment to rest in the hazy warmth of the noonday.

One November day a pair of speckled siskins, driven southward from their northern evergreens, found this hemlock tree. For days they feasted on its seed-laden cones, storing fuel for many snowy days to come, and gladsome went their way.

From these opened cones have scattered many seeds, which even now are building tiny trees. In after years one of these will replace the spire which now bears this branch, and in its turn will shelter the wild folk from wind and storm. Other seeds, wind-borne, will plant new groves, far from the mother tree, beneath which our children's children will romp and hunt for orchid or azalea.

Oft from the north the frost-laden breath of winter blows cold on this bleak ledge. Ere long myriad starry flowers, falling one by one, pile high upon these needle sprays the wreaths of pearly snow. Then seems this north-born forester at home.

And so the life of the hemlock spray goes on through the joyful years. Each season winged visitors from the Arctics and the Tropics alike enjoy its hospitality. Through sun and storm, in cold and heat, it works to build the massive trunk, that beast and bird and insect may find rest and food among its branches, and its wood may shelter and warm the sons of man.

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NATURE MAGAZINE

Vol. VII JANUARY, 1926 No. 1

To minds oppressed with the cares or the sorrows of life, the soothing influence of the contemplation of Nature is peculiarly precious.—ALEXANDER VON HUMBOLDT.

FEATHERED GUESTS OF THE WINTER SNOWS

By R. BRUCE HORSFALL

(ILLUSTRATED BY A FULL-PAGE INSERT IN COLOR FROM A PAINTING BY R. BRUCE HORSFALL)

WHEN WINTRY winds howl and snows from the northland cover bush and brake, great crag and lowly stone fence, when ice fingers hang from eaves in an uneven fringe of crystal, what do the outdoor creatures do for shelter and for food? Some animals build snug homes and store away food against the lean season. Not so the birds. They must meet the change of seasons, if they choose to linger in the North, as best they can.

The New Jersey fall, one year, was remarkably warm and bright, with no snow and little freezing weather. January dawned lovely and clear, shirt-sleeve weather. But many there were who shook their heads, saying, "It's too good to last." Even we humans, not so finely sensed to the uncommon in the time, the day or the atmosphere, as the outdoor folk, felt that something was boding.

The birds and other wild creatures sensed the change long before we did. They knew, what we only surmised, that such a day was what is commonly known as a weather breeder. Something unusual was in the air.

In the early morning the sun shown bright and sharp, too bright in fact, a sort of burnished copper brightness. The wild children were all excited, the birds sang some, and played, but they were restless.

Along about noon, a hush settled over the world. The birds slunk about from tree to tree, from cover to cover, awed as it were by some oncoming monster. The chipmunks, out unusually late in the season for them, now holed up, and, so to speak, drew their holes in after them. By noon their burrows had all disappeared, stuffed to the brim with leaves and, like the children of the New York ghetto, "sewed up for the winter."

Imperceptibly the sun grew dimmer and dimmer and twilight settled over the land. About three o'clock lights appeared in the windows round about and night was upon us long before its usual wont. An unnatural stillness prevailed. The fear of an unknown tomorrow was felt by all creatures alike. There were many restless heads that night.

Although no breath of wind stirred the fallen leaves, the chimneys moaned and windows creaked in audible protest. A hushed, soughing whisper went through the pines and leafless trees.

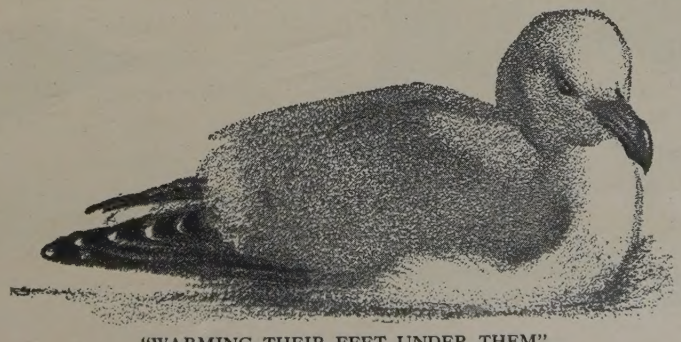
The next morning a gentle snow was falling, covering everything with its mantle of purity as if Nature was spreading a warm white blanket of protection over the world in preparation for what was to come.

That afternoon a strong wind arose and the mercury dropped—dropped, not as a feather from a bird in flight, but as a stone from a far-flung meteor finds a resting place on the world below. The wind veered to the north. The snowflakes became smaller and smaller until they were but tiny particles of ice. Driven slantwise with the wind, they stung like so many needles on exposed face or hands.

For three days and three nights the storm continued unabated. The intense cold, direct from the polar cap, held on for several weeks.

About noon of the first day, while the snowflakes were yet large and fluffy, a flock of forty snow buntings came from the north. Through the swirling mist they appeared like so many larger flakes dropping into a gentle swale among a patch of weeds. With them came a half dozen Lapland longspurs, both species from the wide open tundras of the extreme north.

I cleaned a wind-swept space of ground nearby and kept it supplied with bird foods. All through the storm I had the joy of seeing my



"WARMING THEIR FEET UNDER THEM"

"The big birds sat in the bright sunshine, hour after hour, near some large piece of bread."

northern visitors accept my bounty. For three nights I saw them go to bed in the cracks and crannies of an old vine-covered stone quarry in the hillside. I like to think that they had been invited there by some juncos who had been making it their winter home.

Snow buntings invariably come with a snow storm. How they manage to do it, goodness only knows! It may be that they can sense a storm three to four days ahead and start their journey accordingly. Or is it not more than likely that they can come virtually with the storm and yet keep just enough in advance to have plenty of time to rest on the way?

CROW AND HERRING GULL

For a time the crows were suspicious of the food but when the gulls came to eat, they ate, too.

After the blizzard had worn itself out, the sun shone bright and clear. A snap and sparkle was in the air, giving a zest to him who was well fed and warmly clad. But how had it fared with our outdoor friends?

A few hard-pressed crows, usually so dashing and dauntless, disconsolately gathered about the fringe of trees along the river. Hungry as they were they dared not go down to my spread on the open ground. It was a little too close to the house, so I broke a loaf of bread and took it out with some table scraps to the edge of the woods. The crows talked it over among themselves. I could hear them saying things about me, and the food.

"That looks good to eat," said one; "Better keep away," said another; "It looks too good, it may be poisoned," from the third crow; "Whoever heard of a man putting out good food for crows?" asked a fourth. So they would have been arguing to the end of time had not a couple of herring gulls happened up the river. They had no fear, but dropped at once beside the food and ate their fill. After that it was nip and tuck who would get the first bite when I threw out the bread and scraps of meat—the crows or the gulls.

For several weeks those beautiful gulls stayed with us. I don't know how many loaves of bread and little fishes were thrown out upon the snow. One loses count at such a time. But there the big birds sat in the bright sunshine, hour after hour, near some large piece of bread or a soup bone, warming their feet under them. How cold those poor feet must have become dangling out behind when the birds were in flight!

One of the best feeding stations for small birds that it has been my lot to conduct was the brick floored, covered porch just outside the basement kitchen of a little farmhouse in New Jersey.

A storm similar to this other blizzard, but without the intense cold, came from the northeast and we were marooned in that house for over a week. The roads were blocked with three to four feet of snow. The poles and wires along the railroads from Boston to Philadelphia were one tangled mass of wreckage. The trees suffered severely from the heavy wet snow.

A few juncos and song sparrows found the partly swept porch a quiet place to pick around in and I soon made it all that any poor bird could wish with chicken feed and bread crumbs and plenty of rolled oats. If there is any one food that all wild creatures east or west enjoy, it is rolled oats. Most all of them eat it, the russet-backed and hermit thrushes, blue-birds, Seattle wrens, and Audubon warblers, as well as red squirrels and jays.

I soon had that porch crowded with winter visitors. Juncos predominated, but I was agreeably surprised to find a Carolina wren joining the group. The list totaled nine varieties—juncos, song sparrows, tree sparrows, white crowns, a flicker or two, a robin, Carolina wren, chickadees and our own pet crow. Probably all of them enjoyed the hospitality of our barn and sheds for the night, for they went over in that direction. I said probably all, but really I must except the juncos. Hardy little snow birds that they are, any snow bank is good enough for them. Snow birds, in fact, as well as name, even in their voices there is the quality of crackling ice.

One evening at dusk I was plowing my way home through

Robert Bruce Horsfall was born with a paint brush in his hand and a love of Nature in his heart. The first statement is literal, perhaps, but it must be pretty close to the fact when we look at the products of his brush. And the Nature-heart is in that brush, or he could never have painted the colored insert that goes with this article or written the story itself.

"FOR SEVERAL WEEKS THEY STAYED WITH US"

"It was nip and tuck who would get the first bite when I threw out the bread and scraps of meat—the crows or the gulls."

he drifting snow of an Ore-
on storm. Out from below
he crest of a curling wave
f snow burst four little black
alls. They went chirping
ff into the weed-covered
ield. I knew by their tink-
ing voices that they were
uncos and turned to see
rom where they had come.
There, about six inches be-
ow the top of the fast-grow-
ng drift, were four holes in
he snow such as a boy might
ave punched in with his fist.

"PHEASANTS WERE IN A HARD WAY"

"I scared up several with lumps of ice as large as my two fists hanging from their tail feathers."

Small wonder such expedient little balls of warm feathers can stay with us through a hard winter and survive. For some of the others a heavy snow is much more of a problem.

The day following, I was out with a sack of chicken feed over my shoulders, scattering it here and there in protected corners, under unrooted stumps, brush piles and other likely places where quail and pheasants might find it. Many of the latter were indeed in a hard way. I scared up several, with lumps of ice as large as my two fists, hanging from their tail feathers. Others had pulled out the tail feathers in their struggle to get loose from the terrible drag.

In my wanderings I came by the source of the creek along which I had been working. In the course of the warm water grew thick beds of cress and other water plants.

This particular stream flowed swiftly in a channel fully three feet across and nearly two feet deep, quite a respectable body of water, and kept a large flat space along its course free from snow and ice. First I flushed a great blue heron, next, some Wilson snipe or jack snipe, as they are known, and killdeer. One could see that they were not faring so badly.

Several robins were feeding along the edge and I stopped to see how they were making out. You can well imagine my astonishment to see them actually dip their heads and shoulders under the water to get some of the numerous insects down among the water cress in the flowing stream. Surely such birds will perpetuate a noble race of robins to the end of time. On my return, a Seattle wren kept just ahead of me along an old fence and found good pickings of spiders hidden away in the corners where post and rail met in friendly embrace.

That evening my family of bluebirds appeared at their old nesting box. They had been away somewhere for two weeks but the heavy snow sent them back for a warm bed. It was still snowing great flakes, but before retiring father bluebird led his family all around the house where they picked off a goodly meal of spiders and probably many insects from under the eaves and overlapping clap-boards. I have never been able to get the bluebirds to eat from my feeding table or shelf, though I found that they would feed from the old marrow bones laid out in the yard for the flickers, probably following the example set by the latter birds. After I discovered them doing that I always kept marrow bones in my yard well stuffed with powdered suet.

Such experiences have partly solved the riddle, for me at least, of "How fares the wild folk in our bleak wintry weather."

Snow, even deep snow, does not appear to affect them to any great extent. But the ice storms which coat the world with a layer as hard as glass play havoc with every living thing. It is then our help is most needed, and it is at such times that permanent feeding stations are vital.

Birds will easily starve to death in three days of ice. But if they have previously been accustomed to eating at your table, they remember, and, no matter how far away, they will find it again in the time of greatest need. Even strangers starving in the wilds will see the well-fed ones and follow them to the feast, fearless in the knowledge that the hand which spreads the bounty is the hand of friendship, which goes, oh so far toward making the whole world kin.

December 29 is set for the dedication of the Peabody Museum of Natural History at Yale University. One of the features of this new museum will be its educational habitat groups, which will eventually number more than a score. In this connection the officers of the American Nature Association are pleased to be able to announce that R. Bruce Horsfall, Art Director of NATURE MAGAZINE, *will paint the backgrounds for these groups. The first two will deal with the old coal measures and cypress swamps. Owing to the fact that these cases are to be constructed over a period of years, it has been possible for Mr. Horsfall so to arrange his work that he can add to his achievements in museum work without interfering with his Association activities.*

MUSK-OXEN, CATTLE OF THE ARCTIC

By Edward A. Preble

COURTESY N. Y. ZOOLOGICAL SOCIETY

CATTLE OF THE NORTHLAND

The winter usually finds the musk-oxen fat and in fine condition despite the snowy covering through which they often must paw for food.

WOULD you seek a winter home in a snowy waste over which sweep the ice-laden winds from the very North Pole itself? Would you choose a land practically without fuel; a land so forbidding that even the hardy native Indians and Eskimos shun it? This is the land of *Ovibos moschatus*, the musk-ox.

Of all the large mammals now found in North America, these cattle of the northland are most truly Arctic. In recent times they have inhabited only the lands north of the limit of trees in northern British America and the Arctic Islands. The past suggests a different story. Remains of musk-oxen closely related to our modern animal, though indicating a species somewhat larger, have been found as far south as Pennsylvania, West Virginia, Indiana, Iowa, and Kansas, as well as in British Columbia, Yukon, and Alaska.

The story of the origin of these animals and of our modern species is by no means complete. The group is believed, however, to have originated in North America. Its earliest forms were probably ox-like creatures whose bones have been found in Kentucky, Missouri, Arkansas, Oklahoma, New Mexico, and California. From this country, apparently, the descendants of these early oxen spread to the Old World. Remains of animals much like ours have come to light in England, France, Germany, Russia, and Siberia. In fact, it was a fossil skull from the River Obi, in Siberia, which revealed the animal to science in 1773, a few years before the living species was formally described from Hudson Bay.

The musk-ox had then been known, however, from popular accounts, for more than half a century. Not long after 1670, when that famous band of fur-traders, the Hudson's Bay Company, built the earliest of its posts on that great inland sea, Europeans first began to hear of this strange animal. During the first forty years of the company's regime, the English and French, jealous and eager after whatever the new country might yield, alternated in the control of York Factory or Fort Bourbon, as they respectively called it. While Jeremie, one of the French officers, was in forcible possession, he met with this new and strange animal near Seal River, 200 miles north of his headquarters. More than sixty years later the Englishman, Samuel Hearne, the discoverer of the Coppermine River and the earliest important biographer of the musk-ox, sent the first specimen to Europe.

At that time the musk-ox inhabited the vast stretch of country north of the great transcontinental forest. It roamed from the bleak northwestern shores of Hudson Bay to the Mackenzie River and over most of the Arctic islands and northern Greenland. In all probability it still existed in northern Alaska. It had practically no human enemies, for a more highly prized food animal, the caribou, ranged in immense numbers over the same area. The native Indians and Eskimos had lived on these so long without diminishing the stock that we may forgive them in their belief that the more they killed, the greater the supply furnished for their use by the Great Spirit. So the musk-ox, ranging in smaller bands, harder to kill than the caribou, and furnishing less palatable meat, was seldom molested.

One day at the age of two Master Edward Preble was missing. There was frantic search. Finally he was found, deep in the woods. From that youthful exploration on his life was a study of the wild. As a member of the staff of the United States Biological Survey, Mr. Preble has studied the flora and fauna of much of North America from Hudson Bay to the Bering Sea and from Texas to the Arctic Ocean.

COURTESY N. Y. ZOOLOGICAL SOCIETY

AN ADULT MUSK-OX COW

The white area on the forehead of this animal shows that she came from Greenland or from the Arctic Islands where the oxen now range.

The summer food of this hardy animal consists of a variety of the grasses and herbaceous plants with which its haunts are plentifully stocked. In winter it must depend on the dried grasses, many of which the frost preserves when laden with nutritious ripened seeds. Also, dwarfed willows appear to be a main standby at this season. Many tracts are swept bare by the wintry winds. On others the animals must paw away the powdery snow. It has been noted that, though they are often lean in summer, the winter season usually finds them fat and in the best of condition.

Much has been written about the relationships of this mysterious creature of the

north. The supposed intermediate status between the ox and the sheep, suggested by *Ovibos,* was current for many years, and formed the basis of discussion spread over many pages, and written mostly by persons who never saw the animal, either alive or dead. It is now agreed, that the animal is most closely allied to the ox tribe, represented in North America by the bison, here its nearest, though still distant, relative. To one who has seen the musk-ox on its native Barren Grounds, this close kinship is apparent. Though clothed with long black hair which almost sweeps the ground, and with the heavy coat of woolly underfur well-nigh hiding its contours, the musk-ox at once betrays by its gait and general behavior its affinity to the typical bovine. A rather decided hump on the shoulders suggests the bison, and the head, when the animal is alert, is held high. Its deliberate motions and apparent clumsiness when not alarmed may give an impression of slowness. This notion flees if the animal decides to retreat or to charge. Many a hunter has been fortunate in being able to climb a friendly boulder to avoid an angry musk-ox. When the animal wishes, it covers the roughest ground and climbs the steepest slopes with an unexpected ability.

COURTESY N. Y. ZOOLOGICAL SOCIETY

BABY MUSK-OX

This youngster was born in the New York Zoological Park, the first to be born in the United States since the ages long past when the animal roamed our borders.

As befits an animal which lives on the most northern land on the earth, the musk-ox is clothed with the thickest of wool, and this is protected by a growth of long coarse hair. His general dark brownish-black color is relieved only by a light brown or creamy area on the back, by the lighter legs, and sometimes by some white about the forehead. Being immune to the attack of insects, for even his muzzle is clothed, he needs no tail to help him to repel their attacks, and has developed none that is visible. The light-colored horns, in the mature bull closely united and massive at the base, descend on either side of the head and turn upward in sharp hooks. They are weapons the very sight of which strikes terror to the wolf, his only natural enemy. Usually traveling in small bands, the older animals of both sexes at the approach of danger range themselves in a circle about the younger ones. So massed they present a solid front of menacing horns that is a complete protection from any enemy found in its haunts.

The musk-ox seems truly king when met on those treeless wastes over which he roams at will and unafraid. Knowing no enemy but the wolf, he tries against the attack of man the same methods of defense that have served him so well through the ages. Against the rifle they are useless, but he stands his ground to the last in a vain effort to protect his helpless kin. It is only butchery to shoot down a band of these magnificent animals. Yet men have journeyed to the Arctic with no other purpose than to slaughter a band of musk-oxen. Thus they help to hasten the day when a noble race, which has survived the successive advance and retreat of the glaciers and now asks only an asylum in earth's bleakest corner, shall have fallen a prey to man's ingenuity and heartlessness.

In its present environment the musk-ox held its own during primitive times, before man's rude weapons, or at least diminished but slowly. But with the introduction and improvement of firearms came rapid changes. Encouraged by a certain demand for the skins, following the disappearance of the bison as a source of robes, the Indians made winter journeys into the Barren Grounds. Within a few years the animal was practically gone from the more accessible part of its range in the interior of northern Canada.

The pursuit of whales in the western Arctic and in northern Hudson Bay, with its accompaniment of wintering crews, wrought further havoc. The Eskimos were employed to hunt, and were quickly able to exterminate the herds in a given area. Let it be remembered, the musk-ox forsakes his chosen ground only in death. Once depleted, a given area seems never to be restocked. In addition the more legitimate needs of Arctic explorers have caused the destruction of thousands of the animals, since they have constituted the only source of fresh provision available to many a needy expedition.

The first musk-oxen to be transported alive from their native haunts were captured as calves on Clavering Island, Greenland, in 1899. They were taken to Norway, and later purchased for the park at Woburn, England. In 1902 the first to reach the United States were exhibited at the New York Zoological Park, and during the next few years a number of others were imported. Contrary to what seemed reasonable expectation, the animals seem to suffer little discomfort in Zoo life. They live to develop favorably in comparison with their condition in Nature. Until lately they have never bred in captivity. Last September two calves were born in New York, but did not long survive.

A MUSK-OX QUINTET

Year-old musk-oxen from Greenland. One of the characteristics of the animals in herds is to fight to the death to protect the young.

The few so exhibited for the education of man are, however, procured at a terrible cost of musk-ox life. They must be taken as calves, and the capture of these young ones can be accomplished only by the death of their devoted relatives. It has been estimated that for every live musk-ox placed in a zoological garden nearly a hundred have been sacrificed. Steps which lead to the hope that its

continental range may not be depleted include the setting aside by the Canadian Government of several immense tracts of land in which hunting other than by natives is forbidden. Traffic in musk-ox skins is also now unlawful.

Within the past few years the domestication of the musk-ox has been advocated. It is believed that by this method immense areas of Arctic territory might better serve man's interests than in any other way. The flesh of the animal, if properly taken care of, is palatable, its milk is very rich, and its skin is susceptible of many uses. The disposition of the animal also lends itself to domestication, but so far no practical steps looking to this end have been taken. Its success would require the cooperation of a hardy race willing to endure the rigors of an Arctic climate as the price paid for independence.

In winter musk-ox-land is well-nigh deserted except for this hardy bovine and his fellow-ruminant, the caribou, a few white-garbed birds and small animals, and the fierce beasts that prey upon them. A land where in midwinter the sun scarcely rises above the southern horizon, and after skimming for an hour or two the snowy hills without affording appreciable warmth, sets on a world of snow and bitter wind! Many of you, perchance, think you know cold and hunger, for we of temperate climes speak of being cold if the mercury falls a few degrees, and for a few minutes the north wind must be faced, or think we are hungry if we or the dinner be delayed. But to most of the human race hunger and cold are merely words spoken and heard, but without meaning. But when one has lain stormbound with scanty bedding in the bitter cold of the winter realm of the musk-ox, lacking supper, and not knowing whence shall come his breakfast, then may he claim to have met, face to face, both hunger and cold.

COURTESY N. Y. ZOOLOGICAL SOCIETY

A STURDY ANIMAL, THE MUSK-OX

The musk-ox shows its affinity to the typical bovine of the farm. A decided hump on the shoulders suggests the bison, and the head, when the animal is alert, is held high.

Winter cannot last forever, even in the Arctic, and the scene changes. The sun, daily mounting higher and higher with advancing spring, gradually exerts its sway. Still the drifts lie deep in the hollows and in the lee of the hills, and each night grow solid with the frost. At this period, in April or May, the musk-ox mother brings forth her single young one, already clothed with warm and downy wool, as befits a child of the Arctic. In the shelter of a protecting drift she hides him, guarding him well from wolf and fox until his strength comes, and he may run with her. Thereafter until he can take his place unaided in the musk-ox world he is protected by the stronger animals from all his enemies save man.

As the season advances, the grasses and sedges spring from the softened earth, even though ice-hardened soil still persists underground. With the growing verdure come back the birds which the north wind, Keewadin, has driven to the south. Earliest come the geese, long before the larger lakes have lost their icy covering, feeding on the berries which the sudden frosts of last autumn have overtaken and preserved for them. With them are the ptarmigan which, more truly of the Arctic, have not traveled so far, and now joyously crow and cackle, in their own way betraying their kinship with man's age-long companion. Larks and long-spurs, returned from their winter haunts on southern plains, rear their young in the flowery meadows. Plovers and sandpipers, which a few weeks before were thronging the South American pampas, twitter and circle about the grassy margins of the shallow pools. On the deeper lakes the old squaw ducks and the snow geese lead their downy broods in search of richer pastures; and on the sandy uplands the cranes, scarlet crowned, stalk about, answering with yodeling cries the messages of brothers invisible in the upper air.

Sometimes, at this glad season, the Eskimos, forced by the laws of primitive nature to live in a treeless land, but who find life less hard if they can glean a few sticks for the manufacture of bows and sled runners, venture southward to the last outlying groves, and occasionally, in later years, meet in amity their hereditary foes, the Indians of the woods, who in the continuous day of this summer paradise, revel in the abundance of its boundless plains and limpid lakes. It all forms a picture which, once seen, can never be forgotten. Those who have felt its spell may easily understand the feeling which prompted the speech of the Copper Indian Saltatha to whom the priest had attempted to describe the beauties of the promised land.

"My father, you have spoken well; you have told me that Heaven is very beautiful; tell me now one thing more. Is it more beautiful than the country of the musk-ox in summer? Sometimes the mist blows over the lakes, and sometimes the water is blue, and the loons cry very often. That is very beautiful, and if Heaven is still more beautiful, my heart will be glad, and I shall be content to dwell there till I am very old."

For a quarter century Mr. Brownell has devoted himself to capturing the story of Nature on the camera film. In that time he has made more than ten thousand negatives on all phases of Nature. He says with pardonable pride that these have all been made from the living things, and, with the exception of a few photographs taken in a zoo, from the subjects in the wild state.

Nature's Rosettes of Winter Green

By L. W. Brownell

(PHOTOGRAPHS BY THE AUTHOR)

HOW MANY of us are there who really know the evergreens? We are all well acquainted with the pines, spruces, hemlocks, cedars and the rest of the conifers whose leaves remain green all the winter. But these are by no means the only evergreens. In fact, they form a very small proportion of the plants whose leaves remain green throughout the year. There are hundreds of other plants whose foliage, at least in part, is to be found just as green and full of life in midwinter as on the warmest day of July. Furthermore, the majority of these plants are those that are commonly supposed to die with the first touch of frost.

Many of us are apt to imagine that Christmas would lose much of its charm were it not for the holly wreaths and twigs with their beautiful bright red berries and lustrous dark green leaves. However, if we are not very careful, we will soon be forced to do without this Christmas green entirely. The holly trees are rapidly becoming fewer and fewer. Several states where once they were plentiful are now practically denuded of them, and other states are rapidly becoming so. It has been estimated that one average wreath is made up of between thirty and forty twigs, each one of which represents two years' growth. Each case of holly branches, such as we see upon the streets during the holiday season, contains at least six hundred years of growth. Holly is of very slow growth, too, and it is doomed unless the extensive use of it is soon curtailed.

THE ASTER

Botanical writings pay little attention to these winter rosettes and appear to disregard their green beauty in the winter.

Two other Christmas greens that are rapidly becoming scarce where once they were abundant are two members of the club moss family, the ground pine and the trailing Christmas green. Both are used in large quantities for the making of wreaths and roping. By the way, do we all know that these little plants produce a powder, composed of the spores of the plant, that is used in the manufacture of our more brilliant fireworks? It is sincerely to be hoped that the extensive use of these plants may be cut down before they are lost to us forever. They are exquisitely dainty little denizens of our woods and will be greatly missed when they are gone.

There is another kind of evergreen, commonest of all and yet rarely noticed by the great majority of us. Many of them are not without considerable beauty in the form of their growth. In the early spring, after the snow has left

THE COMMON MULLEIN

A pretty rosette that does not mind the cold snows of winter and is revealed in spring ready for its work.

the ground, we may find these evergreens, leafy, bright green rosettes, starring the ground everywhere in pastures, old fields, along the roadsides and in our gardens. When we see them, if indeed, we deign to notice them at all, we are apt to consider them to be the first growth of the spring. They are, actually, the growth of the fall previous, and we would have found them then, had we taken the trouble to look, some as early even as the latter part of September. Also, at any time during the months between, even when the ground was covered deep with snow, had we dug down where some upstanding dead stalk showed the way we would have found them there just as green and cheerful looking as in the spring, despite their cold covering of snow.

There are very many plants that form these rosettes, and it is strange that there is little to be learned concerning them

THE FERN-LIKE TANSY

It belongs to the group of perennials that form their basal leaves in the form of rosettes in the fall and live through winter.

in most of our popular botanies. Even the more technical ones have very little to say about them. By careful searching through many works I have found that "Many plants produce within a year at the end of their upright shoots a large number of leaves which radiate out from the stem with very little horizontal divergencies, standing close above one another and forming a so-called rosette. In order that all the leaves of such a rosette may receive an equal proportion of light it is absolutely necessary that the upper leaves should be considerably shorter than the lower. And in all rosettes this is actually the case. However, some very interesting modifications are to be found." And again: "When the leaves of plants furnished with tap roots are arranged in whorls and are without internodes, and the rosette rests on the ground, there are always one or more main grooves on the upper surface of the leaves and the

THE TALL THISTLE

This prickly rosette of the biennial can be found on many old fields and in most gardens if one will look.

leaves have such form and positions as to compel the rain which falls upon them to flow centripetally, or towards the tap-root growing vertically beneath the center. Plants with petiolate leaves which conduct rain centripetally always have on the upper side of each leaf stalk an obvious groove, the

SHEEP SORREL

One does not usually think of sorrel as a winter green, yet if you will dig away the snow you will find it so.

THE RATTLESNAKE WEED

In a rosette the leaves are arranged in exactly the same order as they are on the stem of the plant later.

lepth of which is frequently increased by the development f green or, in many cases, membranous ridges on the two ateral edges."

This is all well enough so far as it goes, but it does not go ar enough. It tells us that these leaves are for the purpose f conducting a plentiful supply of water to the tap-root,

THE HAWKWEED

Its pretty rosette formed the previous fall is ready to send up a central shoot of the plant when spring arrives.

which is the root that extends downward from the end of the stem and is of most importance to the plant, and it describes, partially, the arrangement of the leaves in these rosettes telling why the upper ones are always shorter than the lower. It does not tell, however, that these leaves are arranged in the rosette in exactly the same order, but very much closer together, as they are on the main stem of the plant when it is grown. None of the botanies, through which I have searched, mentions their evergreen quality, one of the most interesting facts concerning them.

In many of them, as in the case of the common mullein, the thistles and the evening primrose, we can see typical biennials, or plants that occupy the first year of their lives in perfecting a rosette, or set of root-leaves, the next year in perfecting the plant, bloom and come to complete fruition,

GROUND PINE

So great have been the inroads into the supply of this winter green for decorative uses that it is facing the danger of extinction.

and then die. In others, as the plantains, hawkweeds, tansy, the goldenrods and asters, we find the true perennials, or plants that reproduce themselves from their roots from year to year and form their basal leaves in the shape of rosettes in the fall to be in readiness to send up the central shoot in the spring. Most annuals produce no basal leaves, therefore no rosettes. They reproduce themselves by seeds sown in the fall which germinate during the winter and sprout in the spring, the plant dying after having produced its seeds.

The leaves of these rosettes often differ materially from the upper or stem leaves, as in the case of many of the goldenrods and asters. So strikingly different are they in many instances that one might never recognize them, although they might belong to a plant with whose leaves he was perfectly familiar, unless he had learned to know the basal leaves as well as the stem leaves of the plants during

the summer when the two could be compared. Everyone who wishes to become thoroughly familiar with our wild plants should learn this difference so that he can unfalteringly name every plant from the rosette alone. Late summer or early fall is the time to acquire this knowledge for at this time of the year all those plants that make rosettes are putting forth these root leaves and the leaves of the stem have not yet died so that it is easy to compare them and note the differences.

The arrangement of the leaves in many of these rosettes is extremely symmetrical, often making really very beautiful patterns. Particularly is this true of the different species of thistles and hawkweeds. Designers of wall-paper and textiles as well as the makers of artificial rosettes might well use some of them as patterns. Nature is inevitably one step ahead of art in the beauty of her conceptions. How little credit is ever given to these little plants for their persistence, resolution and hardihood. They quietly keep life in themselves throughout the cold winter months, although frequently covered by snow for long weeks at a time. In the spring they are ready to perform their share of Nature's work.

They are frequently so numerous as fairly to carpet the ground over considerable areas of space. Almost any field is certain to produce from ten to twenty different varieties. I have seen an old lot of perhaps half an acre in extent that contained literally thousands of these rosettes presenting a complete covering of green as soon as the snow had gone. Any old garden is sure to be thick with them. The photographs accompanying this article were all taken on an afternoon's walk in mid-December. Thousands of the same species as those photographed were passed, as well as many of different species that, for one cause or another, did not show sufficiently perfect form to make a good photograph, but they all provide interesting camera study.

THE GIANT SPIDER CRAB OF JAPAN

This monster in the photograph compared with the ordinary crab. It has two powerful biting claws and measures fifteen feet from tip to tip.

King of All Crabs

By Herbert Beardsley

THE KING of all Crustaceans is the great Spider Crab of Japan, so gigantic in size and so unlike any other of the group that it seems almost like a creature of imagination. The accompanying photo shows this remarkable animal in comparison with the ordinary crab of home waters. Among its striking and wonderful features are the two long, powerful, biting claws, or arms. These measure fifteen feet and are capable of inflicting a dangerous wound. Four pairs of long legs, terminating in points, reach out from the body, which is about a foot and a half across, resembling a rough stone. When stretched out on the ground the great crab has a radial spread of thirty feet. The animal is well named the Spider Crab, for when held up by a man it bears a marked resemblance to a huge spider.

These monster crabs are caught in a long, seine-like net in shallow bays in certain localities. It requires a half dozen alert and skillful fishermen to capture and handle a specimen. The nets are set at high tide at the entrance of the shallow bays opening from deep channels. The monster crabs come up at night out of the channel to feed on the flats, and go down again with tide and thus run into the nets. The ingenious Japanese fishermen prepare a rack of bamboo made with a radiating branch for each claw; upon this the great creature is lashed carefully and carried ashore without danger.

THE GIANT AND THE ELF

By William L. and Irene Finley

(PHOTOGRAPHS BY THE AUTHORS)

ONCE UPON a time there was an elf who lived in a giant's ear. The giant was thirty feet tall, one long arm reached up toward his ear, the other swung in a grotesque curve toward the ground. Stiff and gaunt, he stood looking at his shadow that stretched away across the desert, for the red sun was sinking behind the jagged barrier of the Tucson Mountains. For an hour not a sound or motion, then suddenly, out of the little round hole near the tip of the giant's head, flitted the elf, a tiny feathery phantom in the light of the western sky, and fairy-like dropped into the dusk of the desert.

The giant was a great sahuaro cactus, the elf was the tiniest of all owls, a gnome living in a top tenement. All day he had hidden in his nook away from the glare of the sun, awaiting the coming of the dark. The night was as day to him, for his round yellowish eyes penetrated every shadow under a starry sky. His wings, edged with downy softness, made no sound of his coming, as he fanned above the creosote and cactus, keenly alert for foolish beetles and careless little animals that played in the desert waste.

The haunts of the elf owl are measured by the range of the sahuaro spires, that jut out of the Arizona desert like great green stakes. How the elf depends upon the giant! It is a well-established tradition that the little owls must have holes in old tree stumps in which to nest, but trees cannot grow in the higher arid stretches. The sahuaro is the nearest kin to an old stump. Of course the elf cannot dig holes in a cactus, so he is dependent upon others who have the tools; therefore the guardian of the little owl clan of the cactus is the Gila woodpecker.

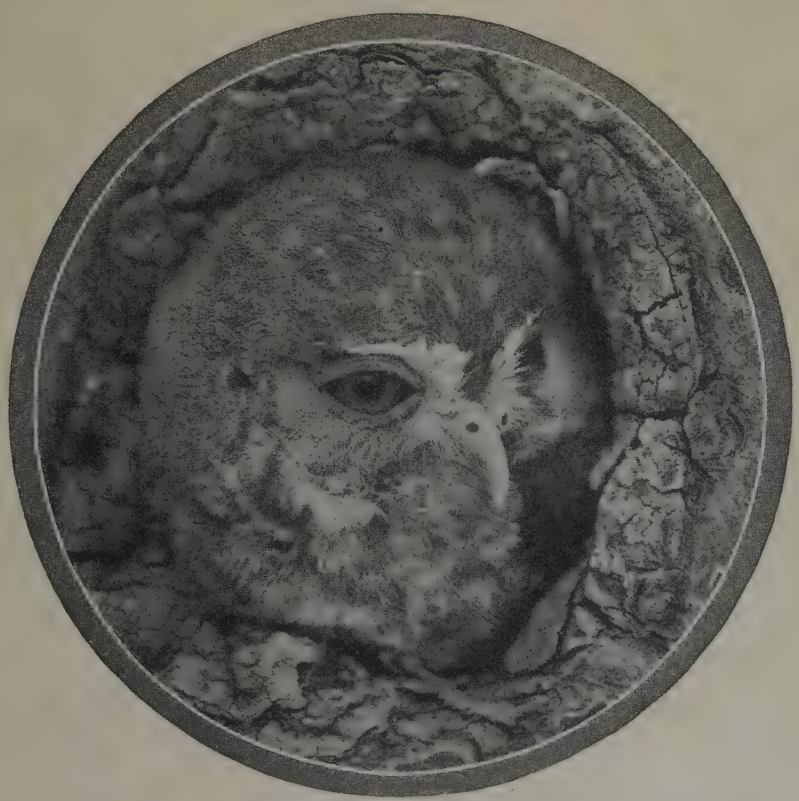
A cactus trunk looks like a poor tree on account of the barricading rows of short thorns, yet the Gila woodpecker and the flickers catch their toes in the rows of thorns and, bracing their tails, bore into the soft flesh and sinews of the plant. It is a smeary task where a bib is needed to keep feathered coats clean from sticky juice. A shampoo is in order after an hour's work in the heart of a cactus. Just why the woodpeckers bore so many holes is hard to say, for almost every old bole is punctured with one or more round doorways. Some of these are made for houses, but in all probability there is good food and water in the spongy pulp—and surely some houses are built for fun.

When a woodpecker drills into a green cactus, the sap quickly oozes out and hardens. The sahuaro must conserve every drop of moisture. The wound heals quickly to prevent further bleeding, and this forms a hard-shelled, gourd-shaped house, far more permanent than the cactus trunk. Look at a giant cactus that has fallen to decay and you will find one or more of these woodpecker homes that has been made years ago.

One may go hunting for elf owls and find them, but it is quite different to learn something of elf owl lore. Spreading one's blankets on the sand where the gaunt forms of sahuaros are thick enough to be called a forest, under the star-lit Arizona sky, is one way of getting acquainted with these little gnomes. You may hear

Readers of Nature Magazine *need no introduction to the Finleys. Their wonderful photographs of wild life, their wide and understanding acquaintanceship with birds and animals, and their charming stories of these associations have made many interesting articles for* Nature Magazine. *Armed with film and equipped with story, the Finleys are lecturing in the east this winter, giving their friends an opportunity to meet them outside the printed page.*

During this year there will be many interesting Finley articles, some of which will tell of strange animal pets they have had.



TAKING UP THE WHOLE DOORWAY

The elf owl is at home, and with his speculative eye he surveys visitors to his abode in the cactus.

THE GILA WOODPECKER

This bird is much like the flicker in its habits. Nearly every giant cactus has holes the bird has bored.

the soft whinny of the love notes and catch a glimpse of the shadow of silent wings; the rest is left to the imagination.

"The way to hunt elf owls is with a long ladder, and there is just one elf owl ladder in all southern Arizona," volunteered a bird-lover. The next day we strapped the three eight-foot sections to the side of the car. After a long hunt and a climb into the tops of nearly forty different trunks, it seemed there was a great shortage of elf owls, for we found not a single one. We came to the conclusion that the little owls migrate in the winter time when the tiny wild life of the desert went into hibernation.

Later, when we visited the same sahuaro forests in May, we not only found several owl tenants at home, but one sitting on four eggs. This was when we discovered what a real pigmy the bird was, hardly larger than an English sparrow, a veritable baby in comparison to the great horned owl. Some of the big owls with a sharp taste for blood are not on good terms with their feathered neighbors. The elf is, because his hunting is limited, as far as we know, to beetles, grasshoppers and even moths that may be snapped up on the wing at night after the manner of fly catchers.

With the jointed ladder against the tall sahuaro, a hand squeezed with difficulty into the round doorway of the elf's home. Great Scott! Someone has set a trap for a friendly and unsuspecting finger! The trigger sprung, and needle claws clutched so tightly that the naturalist just had to grin and bear it, hoping the mother might feel some compunction and release it. Not so. At every twinge of the finger, she clutched for a tighter hold. The top of a twenty-four-foot ladder, with no armhold except the barbed cactus trunk and with one hand in a trap, is at best not an enjoyable way to study elf owls. Finally the hand was pulled out with the little fury hanging tight. She was slipped into a coat pocket. She had brought first blood, but we soon had her photographed—but photographs leave little to imagine.

There is a thrill to bird hunting—the thrill of the discoverer who meets for the first time a new species, or one he has heard and read about, but never known. There is also the thrill of the photographer or artist, whose perhaps greatest pleasure is posing his live prize for the enjoyment of others.

THE GIANT AND THE ELF

The investigator has climbed the giant sahuaro cactus to inspect the elf who lives there, pictured in the upper left-hand corner.

PHOTOGRAPH, RHEA HOYER

SELF-SUFFICIENT

A proud cat with a penetrating eye and a thoughtful pose.

"My interest in wild life really began when, as a boy of fourteen, we lived in northwestern North Dakota. It was there I learned that the muskrat always washes and pares the bulb or lily root before he eats it, and that the maternal great horned owl will feign a broken wing to lead one away from her fledglings," writes Mr. Lampman. In this article he has imparted his charm of writing to a tale of Tabby and Tom.

Some Cats of Ours

By Ben Hur Lampman

PHOTOGRAPH, H. T. MIDDLETON

ON EXPLORATION

Taking a careful and speculative look at this strange man-run world.

ALL THINGS considered, it would be well for the cat if really it did possess those nine lives of proverb, since the paths its walks are hazardous. Happy is that cat which has a home, where understanding and affection are its portion, and if it be a wise cat it will keep to its own back yard. The way of the world, commonly speaking, is rough on cats—though almost any cultured cat, for proper cats are cultured, might teach tolerance and manners to its betters. Cats kill, but they do not kill by poison, and it is a sorry argument to say they would if they could. The refinements of hatred are beyond poor puss.

There is no quarrel with those who dislike cats. The antipathy is their misfortune, and, unless it approach the proportions of a mania, distrust or dread of cats possibly has no more serious foundation than a complete dearth of reasonable and mutual acquaintance. And I make bold to say, knowing that by some the statement will be scouted or held to scorn, that given but a fair opportunity there are cats that could ingratiate themselves with the hardest of hearts, the most intolerant of cat-haters and baiters, and there purr themselves into serene and drowsy old age. And such cats, speak as grudgingly as you choose, are far from infrequent. I have known many of them.

That which follows, but loosely threaded together from many memories, is by way of being a reply to the critics of house cats. It is not intended as an unassailable argument for cats, but it undertakes to answer that most cruel and unworthy charge against them—that they are wholly without culture or true affection, and that in each cat selfishness is shrined as the god of cats. With what propriety may we, of all the various forms of life, indict a fellow pilgrim on such a charge? Cruel? Of all the animals we alone wage war.

I have forgotten the colors of Potlatch, for he lived in the long ago, and catnip has bloomed and withered these many seasons since that excellent cat was gathered to his fathers. But it seems to me there was a touch of maltese in his shabby coat, and I know there was more than a touch of charity and love in his heart. As most kittens come, he came to the kitchen door seeking dole and was suffered to dine and remain for only an hour, since the household was by no means catless. Yet when that hour was spent he lingered, and his period of grace stretched itself into a lifetime of nine lives, hazards considered.

In this fashion he won his name. As a kitten he displayed high talent in the pursuit of mice, and long before he was an adult Thomas he had purged the cellar and the attic and was forced to range far afield.

I will not say that he confined himself to mice, for no cat does. He was as hardened a hunter as any man who haunts the duck marshes. But in the cosmos of the kitten there was no trace of self. He hunted that he might give, and he gave utterly and recklessly, as one who says of his treasure: "It is a small thing, and of little consequence." So we called him Potlatch.

When Potlatch came in with his kill, the wide full eyes of him were happy, and his gait was hurried. Straight to one's feet he would trot and lay his gift there, and, with sundry mewings and coughs and urgent purrings, he would beg your acceptance. It was useless to dispute with him, as long experience taught that he would not reclaim his present, so we used to call one of the other cats and in our turn play benefactor. And only then was Potlatch content. More, he fairly beamed as his growling comrade consumed the game, and thereupon he took up the narrative of his adventure. Beneath your feet, before you on the table, trotting behind as you went to the garden, that loquacious cat insisted on your hearing to the last detail the story of the hunt. I sometimes wonder if the man who first told the engaging yarn of Puss-in-Boots had not in his time known and loved such a cat as Potlatch was. That which passes for generosity in human-kind, is it less than generosity when one encounters it in cats?

Leander and Bill Henry were friends, and, as is often the case in firm friendships, the one was brilliant and versatile, while the other engaged himself largely with complete and self-effacing admiration. To Bill Henry, heavy of body and mind, the witty paws of Leander, the swift, lithe antics of

his graceful body were no less than marvelous. For Bill Henry would raise a paw to strike, in their mimic duels, and poise it in midair, and look reflectively at it, and try his hardest to recall what it was he had intended to do with that paw. But the reactions and reflexes of Leander the peerless were instantaneous and dazzling. And, gosh, how Bill Henry cared for him! He was lost and unhappy if his gifted companion strayed out of his sight—and inconsolable until Leander strolled in again.

Well, it was Leander who sickened to death, and who strove with a brave heart to purr it all away, and to make pretense of happiness even when he could not lift his head. It you stooped to Leander then, inert and dying as he was, the old gay light came most pitifully into his eyes, as though it were all a joke, and very low and shaky came his invincible purr. A cat, you say? Well, a trifle more than a cat, perhaps; a cat plus love and courage. Bill Henry wouldn't leave him. An agitated nervousness had replaced poor Bill's stolidity. There was something the matter with his friend—something hideously and terribly wrong. And so Leander died. Are there degrees to grief? Bill Henry grieved Leander. He cried most piteously beside his stiffened playmate. Both love and death he knew for what they are.

If you seek for selfishness you must draw from the well of sorrow. Not a bit does it matter whether the test is for man or brute beast. I believe that Bill Henry and Leander proved this most conclusively, as I believe that a certain nameless hobo kitten also demonstrated this truth. A dog called "Deacon" was the kitten's friend, and that Deacon should have made friends with any kitten was an almost incredible thing, since Deacon was a killer of cats. He was a massive pointer who dwelt in a country printing office, and who possessed but two absorbing passions, the hunting of prairie chickens and the chasing of affrighted house cats. And into that office on a day in spring, when Deacon was keenest for cat-gore, the tramp kitten paced quite unafraid.

A FAIR TRIO

These cat studies might be labelled surprise, fatigue and disdain. Which is which?

It must have struck Deacon as a distinct novelty that any cat shouldn't have heard of him; that any cat dared stroll carelessly into his dread domain—and of all cats a half-grown lean little mop such as that one. But deep at heart the pointer was a kindly old duffer, and, moreover, he had at most times a saving sense of humor. Perhaps he was amused, or perhaps his better nature was touched; at any rate when the kitten declined to flee, and without so much as a fluffed tail in token of dismay, Deacon adopted the kitten. Nothing loath, the kitten accepted the adoption. Within the hour the terror of all cats in town, save one, was snoozing beside the office stove, the kitten comfortably sprawled on the pointer's fat barrel.

This custom once established, Deacon insisted upon its continuance. When a bit drowsy he would return to the office, gravely hustle the kitten stoveward, and slump down with a sigh of deep contentment. Between times he hunted cats.

Through an open door one evil day slipped a country cur, and at a bound he had fleshed his ugly teeth in the kitten, intent on shaking its life out. Hasten, Deacon! There is need for your friendship now! He flashed into the room, white fangs bared, and tumult raged and yelpings—but the yelps were those of the cur, and even as he yelped the cur was gone, dwindling out of town.

Well, the kitten was rather badly used up, all but his happy heart, yet the way of a dog with a cat hadn't taught him fear of Deacon. He licked his wounds as best he might, and cleansed himself as a true cat should, and sang his song when stroked and pitied—and then he crawled into the paper cabinet and prepared for the great adventure. Like Leander the peerless, this kitten purred while the chill crept over him, and tried ever so hard to make you understand that it was all right, and that he was grateful for your sympathy. Out he went into the blackness, cheerfully, as a young gentleman should—and I say, caring not at all who disagrees with me, that there ought to be a light for him somewhere. Deacon missed him.

Mrs. Milligan, ample body and ample heart, had an old tabby whose years of bearing kittens were done. She could lie on a rug in the dusty sunlight and dream of her lively litters, of the oddly commingled joy and vexation of family cares now happily past. She was an ever-so-great-grandmother. But like all grandmothers, whom God bless individually and collectively, she didn't do anything of the sort. She mothered all young and friendless creatures, and doted upon spraddling puppies, and even eyed children with a benign and speculative gaze. After all, children were a trifle impossible. But yearly when the hens hatched their broods Mrs. Milligan's tabby went out to the barn and dispossessed some protesting biddy of her downy darlings. Out flounced the hen, for pecks and buffetings meant nothing to that incarnate motherhood, and there was Mrs. Milligan's cat, curled in the nest, and mustering all her wiles to persuade those chicks that she was a hen. Possibly Mrs. Milligan's cat had a complex. I'm sure I cannot say. Possibly the urge to mother and defend and cherish is itself a complex. The riddle is beyond me. I am interested only in the fact—let the Freudians read it as they will.

Certainly the instincts of a warm and unselfish motherhood are very strong in the tabby. Here is a clipping which tells of a Minneapolis cat that mothered two cubs of that savage killer, the timber wolf. Shake your head, if you choose; you are one of those who do not know cats. I have seen mother cats give suckle to infant rats and rabbits, and

lavish upon these changelings full store of maternal affection. Were those cats beside themselves with the rapture of motherhood, that they did not know their natural and accustomed prey, or was there a kindlier truce hidden somewhere within those sloping skulls, back of those blissful eyes? Whichever way one views it, the evidence is not conclusive. You may take your choice. Personally, I have a high regard for the feline intelligence. Let us reverse the situation. I have seen a mother-cat smile tolerantly, and heard her purr with pleasure, when a little she-dog herded her kittens into a corner and tried to play mother to them.

Culture in mankind is always at conflict with instinct. We have schooled ourselves to habits, both mental and physical, that our grandsire the caveman would have jeered at. And this we have done because we perceived it was not well to yield our instinctive impulses the whip-hand. But that we are imperfectly schooled, and have yet to perfect ourselves in the lesson of restraint, is sadly attested everywhere. This being true, we should find within us a fellow sympathy for cats, in whom the instincts are paramount and culture is hard pressed and slowly acquired.

PHOTOGRAPH CORNELIA CLARK

THE FIRST SNOWSTORM

Apparently the fun of building a snow man extends to the four-footed feline group.

In cats the homing instinct is a vital thing. Thus we say, laughingly, "The cat came back." Taken miles away from home, and there deserted, cats have trotted surely and swiftly back again. And usually it is difficult to prevail against this instinct when the family residence is changed. The accustomed garden, the familiar alley, the warm nook beneath the rose bush—all these call persuasively to Thomas and Tabby, and often they leave their friends to make their ways back to the old haunts. Here is instinct warring with culture again, for such cats are tremendously unhappy, and though they have found the place they sought, and though they cleave to it, they are lost without the friendship which endeared that place to them. When reclaimed they manifest an ecstasy of relief and gratitude. The lesson such cats have learned is not an uncommon one. How often have people discovered, to their deep and lasting sorrow, that when absence sets its seal upon a dwelling, happiness cannot enter?

We have a cat, a half-blood Persian, of the name of Chester. He is at all ordinary times a self-sufficient creature to the outward view, impatient of petting, assured of his own importance to the household, and given much to walking alone. You would say of him that he was a testy fellow, and that his god was selfishness. He walks with a swagger and his eye is hard. But so do many men who are sound at heart. Neglect him and he will come to your side, begging to know why he has been forgotten, and the hardness is quite gone from his eyes. Between Tam the collie and Chester the Persian half-caste apparently there exists a truce of lofty and dignified indifference. Yet when these precious frauds believe they are unobserved, when they meet alone in the garden or on the porch, they touch noses most fraternally and beam one upon the other.

No animal save the dog may be more shrewdly wounded by a blow or a harsh word. This cat of ours, but an instant before at pose as a lord of creation, shrinks at a scolding, though he has never been struck, and by every means within his capability strives within the hour to show contrition. Absent yourself for a day or two and he will search for you, and ask of others why it is you are gone and where, and there is no trace of condescension in the eagerness with which he hastens to meet you when you have returned. Is he thinking in terms of steaks? You have none. Does he crave the stroke of your hand? No, he is normally averse to petting. What is it then that he manifests, unless it is the tribute of an affectionate and generous friendship?

Imogene, Pansy, Black Tom, Boob, Nonny, and a score of others—they are spaced back through the years, and not one of them is forgotten. Between them are cats of lesser degree, cats that were silly, stupid, annoying or thievish, cats that lacked the capacity for culture, just as some folks lack it, and some dogs. But the cats I have cared for were, each in its way, not only cats but real individuals, endowed with far more than the degree of comprehension, and of sentiment, one expects of mere cats. I would say again that their betters might have studied those cats to advantage.

There are many cats you would not want, nor would I care to undertake their training, but I have known but one cat who was all they say of cats. From kittenhood this fellow was a rebel and a savage, although he answered to the promising name of "Blue Pie." In Blue Pie's

PHOTOGRAPH S. W. FROST

YOUNG, WHITE AND INNOCENT

Some cats enjoy a safe and happy youth with silver balls to play with, others just grow, like Topsy.

eyes there was never anything save suspicion, craft and hatred, and fully tame though he was, tame and housebroken, his claws were always half unsheathed to strike, and his teeth eager to pierce. Blue Pie was a throw-back to the jungle, and so soon as he sensed that this was true he left the house and became a lone wanderer, never returning. A glimpse or two of his maltese flanks, slinking smoothly through the thickets, the shine of his eyes at night in the alley, and then no more of Blue Pie. No doubt he died fighting as murderously as any Malay. I have not known another like him.

Few animals are more susceptible of transformation through understanding and affection than is the house cat. Often those who do not care for cats will say, when they have made acquaintance with some amiable and clever pet of another, "If I could have a cat like that, I shouldn't mind having one." Cats "like that" are almost never the product of chance—they have been led beyond themselves, sublimated, by understanding and sympathy. Into the wild, cold eyes that were their heritage, into the alert, suspicious brain, into every interstice of that normally lonely and self-sufficient ego, something has been instilled—a white magic of tolerance and human affection. Whereat the wildness has faded and is no more, and the coldness has been quite warmed away, and trust has replaced suspicion. He sits there with a witty, whimsical gaze fixed upon you—a living tribute to culture.

PHOTOGRAPH INTERNATIONAL

WISE, WILY AND WHISKERED

You can picture the swagger in this cat's walk from his eyes, not exactly hard but certainly a bit world-wise.

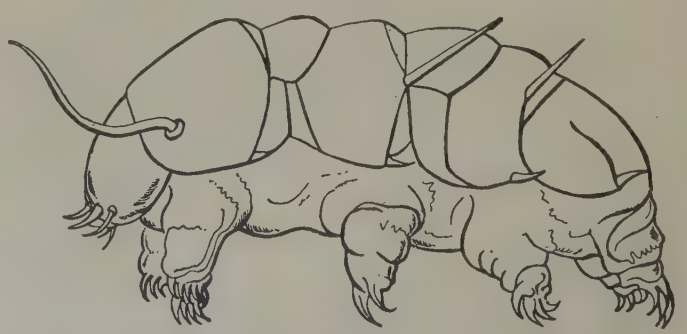
And a last word of the cat as a killer. He kills at the direction of an instinct fundamentally sound and inevitable—as men sometimes kill, but not always. For certain crimes that are not crimes to him, but merely the creation of our viewpoint, he should be restrained, rebuked and chastened. But let no critic of cats forget, as he mumbles his chop or delights in his breast of pheasant, that that which is murder when the cat commits it is utility and sport when man does. Cats do not shoot from ambush.

A Microscopic Rip Van Winkle

By Jane Ross

WHILE man is bending his best efforts toward solving the mystery of death and postponing the day of its visitation, some of his more lowly fellow creatures are achieving unbelievable success in this line with no fuss whatever. They get results by the simple method of conserving their vital energies in the face of hostile conditions rather than expending them in a useless struggle.

The tardigrade possesses remarkable power in this respect. It is among the smallest of the animalcules, measuring from one-fiftieth to one twenty-fifth of an inch in length. Its exact place in the zoological world is still uncertain. There are several known species and the distribution is wide and numerous, yet, because of its size, the little creature is seldom seen. It owes the name tardigrade to its slow, deliberate locomotion, but is also known as water bear.



A TARDIGRADE (FROM BYERE) HIGHLY MAGNIFIED

In the active state the animal is squat and plump, proportioned something like a tortoise. One species has been described as looking like "a dear little sucking pig in plate armor." There are four pairs of legs, ending in claws. The entire body, including the claws, is incased in a cuticle or transparent shell, which is shed at intervals, and in the shed cuticle the eggs are laid. The mouth is supplied with two stylets or teeth, which are used to pierce the moss and suck in the sap. The abdominal cavity is very capacious and contains the viscera, but there are no special organs of circulation or respiration. The viscera are bathed with fluid which fills all the body spaces and moves as the body moves. Oxygen is supplied no doubt by means of this fluid, which takes the place of blood. Floating about in it are numerous cells packed with food reserves, which the system can draw upon in case of food shortage and the necessity for a long sleep.

As its name implies, the animal's habitat is damp places—wet moss, sand, or ditch débris. Moisture is its very sustenance, and as that dries up he dries up with it. The body shrinks, the skin shrivels and folds, the animal looks like a small grain of sand. To all intents and purposes it is dead. But come rain or heavy dew, presto! the grain of sand swells, wrinkles smooth out, legs slowly emerge and move feebly, and before long a plump little water bear, unaffected, ambles off about his business.

ENEMY TUNNELS TREASURY VAULTS

By Thomas E. Snyder

ENEMIES have invaded Washington City and committed sabotage. They have tunneled under the Treasury and entered its vaults. They have entered the vault room of the Bureau of Engraving and Printing and destroyed paper money, silk fiber bond paper and postage stamps. They have made away with battleship plans at the Navy Yard and destroyed the foundations or flooring and injured the contents of valuable buildings, including the buildings of the National Capitol, the U. S. National Museum, Library of Congress and other public buildings. In other localities these enemies have destroyed stored food, cloth, books and paper, bandages in hospitals; have overthrown telephone and telegraph poles, short-circuited cables, and destroyed the foundations, flooring, woodwork and contents of churches, railroad stations and many beautiful residences. They are native insects, however, and *not* of foreign origin.

The reason for blaming the injury caused by white ants or termites in the United States to imported foreign species is because many of the most injurious insects in North America have been imported from abroad. However, this is not true of all our injurious insects.

The mention of termites or white ants brings to the mind the spectacular termite nests and the serious damage which these insects cause in tropical countries. Yet termites are by no means restricted to the tropics! In North America, certain regions from Vancouver Island, British Columbia, in the Pacific Ocean, southward to the Florida Everglades, are inhabited by forty-two species, representing eleven genera of termites of uncommon interest and variety. Mainly being species of subterranean or wood-boring habit, they are not as spectacular or as common as their mound-making or tree-nesting relatives. Very few Nearctic termites have conspicuous habits or come above ground out into the sunlight, except during the annual colonizing swarm.

In the United States, termites probably occur in every state in the Union, more commonly in the south, southwest and on the Pacific coast. They are naturally to be classed among that most interesting group—the social insects—comprising the ants, bees, and wasps. Termites live in colonies which are made up of more or less highly specialized forms or castes, with both fertile and sterile forms. Each of these forms has a distinct rôle in the community. There is a well-defined division of labor. Some termites have no worker caste, others no soldier caste, and still others nonmandibulate soldiers or "nasuti." These nasuti secrete a liquid which they exude from the tip of the nasutus or "beak" for purposes of defense.

There is always an element of unusual interest connected with searching for and finding the egg-laying termite queen. In species where there is a centrally located "royal cell," success is only a question of time, patience and labor. It was once thought that, since the queen mother was the source of the colony life, if she were destroyed the termite colony could be exterminated. This has been disproved by more recent studies. Several different types of reproductive forms occur—winged forms that lose their wings after a short colonizing flight for the purpose of founding new colonies, sexual forms with wing pads, and wingless reproductive adults. The winged forms are the normal type and occur as a single pair, whereas there may be hundreds of the other forms heading colonies. The reproductive forms with wing pads and the wingless type usually have but little color to the body. The eyes are reduced and they rarely come above ground or leave the burrows in wood. Since the eyes are reduced they have some other senses, such as the tactile sense or sense of odor, highly developed.

Although they become enlarged, no types of reproductive forms of Nearctic termites ever entirely lose their power of locomotion. Their location in the colony will depend upon the season of the year. In the case of subterranean termites, they burrow deeply below ground or to a lesser depth under stones, and such during periods of intense heat or drought in the plains, arid or prairie regions, or below the frost line during winter in colder climates. These termites migrate when conditions are unfavorable.

The nonsubterranean termites are not able to leave the wood. In the northern extension of the range of species of *Termopsis*—the largest living North American termites—the

One evening, in the spring of 1917, Mr. Snyder was in the lobby of a hotel in Brownsville, Texas. As entomologist of the United States Bureau of Entomology, then and now, he was on a field trip making a preliminary survey of the termites, or white ants, of the United States, on which he is probably the leading authority. A stranger approached him, asking if he were not T. E. Snyder of Washington. An interview ensued. The next morning a local newspaper published the following startling war news:

AN ALIEN ENEMY INVADES HOMES IN BROWNSVILLE

Despite the great precautions taken by the State, War and Navy Departments to prevent any invaders from landing in the United States, it was announced yesterday that large numbers of alien enemies had landed and were getting in their deadly work right here in Brownsville. In fact, according to a government agent sent here to investigate the situation, there are more varieties of the enemy located in Brownsville than in any other place he has so far visited.

While no one has been aware of their presence, the invaders have been getting in their deadly work, and drastic measures will have to be taken to prevent serious destruction to property throughout the country. The enemy, instead of attacking persons, is attempting to destroy buildings, furniture, etc., by boring in from the outside and so weakening the structures that before one detects anything wrong the buildings or articles of furniture are in danger of collapsing.

Even in Washington, the best guarded city in the United States, are found some of the enemy pursuing their work of destruction.

COMMON EASTERN TERMITES

They are both workers, and their accomplishments in damage warrants their classification.

WORK OF TERMITES

Part of a beam from an adobe building near Tucson, Arizona.

logs or stumps which they inhabit are covered with snow and ice for long periods in winter. Usually such habitations are large, however, and have galleries extending deeply into the wood.

The huge mounds constructed by termites in Africa are of such great hardness that the lower domed mounds were used as vantage points by both wild bulls and native warriors. Other mound termite nests in tropical Africa are like negro huts, in considerable villages, tall round pyramidal nests and nests like roofed turrets. The architecturally perfect and regular system of sheltered openings for ventilation of termite nests of the Lower Congo excel those of the wasps and hornets. In Australia the meridional magnetic nests of the compass termite dot the landscape and always run north and south, the broad surface facing east and west. Equally interesting are the spherical, "nigger-head" tree nests of tropical America, which are so hard as to cause a machete to glance and strike fire. Nest material is used for polishing jewels. The material of mound nests in Australia is used to make excellent hard tennis courts.

Unlike many tropical termites, our native species do not construct huge mounds, or build tree nests, but live in burrows in the earth or in wood. There is no permanent, centrally located "royal cell" in which the "king" and "queen" are imprisoned, and there are no "fungus gardens" or "nurseries." Nevertheless, their nests or colonies, while hidden or nonconspicuous, are interesting and worthy of study.

Of Nearctic termites, with more striking habits, some species of *Amitermes* cover vegetation in pastures in the southwestern United States with earth-like tubes, often causing the vegetation to wither over considerable areas of grazing land. In the eastern United States, other termites sometimes extend their earth-like tunnels up dead trees. These are never as common as the striking wood-pulp tunnels constructed by species of *Nasutitermes* up the trunks of coconut trees in the South Seas or even in the Antilles.

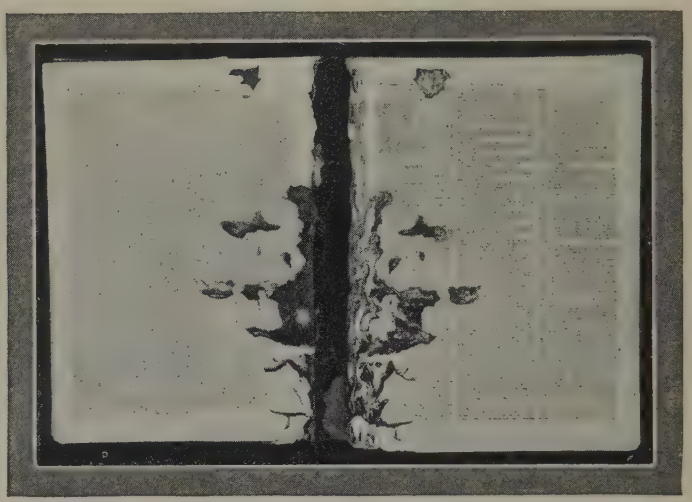
The principal food of termites is cellulose, which they obtain from dead or living vegetation. Our native termites may be divided by their nesting habits into the three groups of wood-inhabiting species which do not burrow into the ground; those which live in the ground and infest wood indirectly through the ground; and earth-inhabiting species which do not burrow in wood. Species in both the latter groups may be termed subterranean termites. They require much moisture for life, which they obtain from the earth.

Subterranean termites live in forests, building their nests in the wood of dead trees, decaying logs and stumps. They live in the foundation timbers of buildings, fences, and any wood in contact with the ground. Or in the plains they inhabit a labyrinth of underground passages in the earth, usually underneath wood or vegetation.

In this country, they are the most injurious to the foundation timbers, woodwork and contents of buildings. They even bridge over substances they cannot penetrate, such as metal, stone, brick, or concrete foundations, by means of small shelter sheds or granular, earth-like tubes constructed by the workers of earth and excrement extended up from the ground.

Since termites are soft-bodied, they always conceal themselves within the wood or within their tubes. In burrowing through wood they often completely honeycomb it, usually following the grain and eating out the softer, thin-walled, larger-celled spring or new wood. They are able to penetrate the hardest of woods, and even attack dry, seasoned wood, provided there is access to moisture in the ground. Subterranean species carry moisture with them in extending their galleries by means of moist excrement mixed with earth up to even the second and third floors of buildings.

Nonsubterranean termites which are injurious—*Kalotermes* and *Cryptotermes*—attack wood directly and bur-



NOT TOO DRY READING

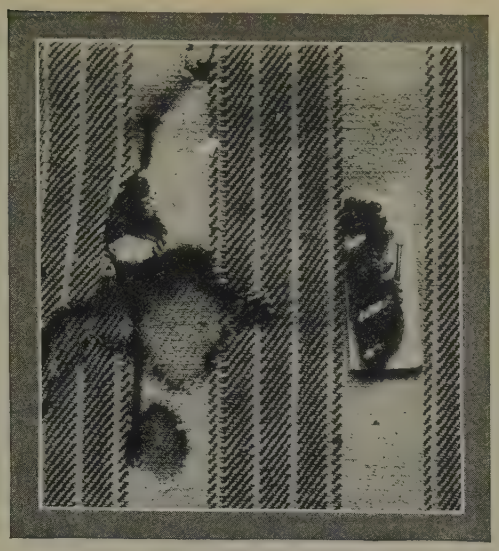
The voracious and hard-working white ants did not find this bound volume of the *Engineering Record* too difficult for them to master—and ruin.

RUINED, ONE BOOK

Termites with a literary turn of mind have been actively at work.

row lengthwise through the hard, dry wood and, instead of following the grain, excavate broad longitudinal chambers across the grain. These termites are destructive to the woodwork and furniture in buildings. They never burrow in the ground. Apparently they can exist without the great amount of moisture necessary to the life of termites subterranean in habit. The dry wood of the woodwork of buildings, telephone poles, cross-arms and insulator pegs far above the ground are damaged.

With the clearing of land and consequent destruction of their natural breeding places in forests, in dead trees, stumps and logs, termites become increasingly destructive to the woodwork of buildings, telephone poles, fences, as well as to living vegetation. Not only trees, shrubs, and flowers, but also truck and field crops, such as tubers, potatoes and carrots, and grapevines in California, may suffer.

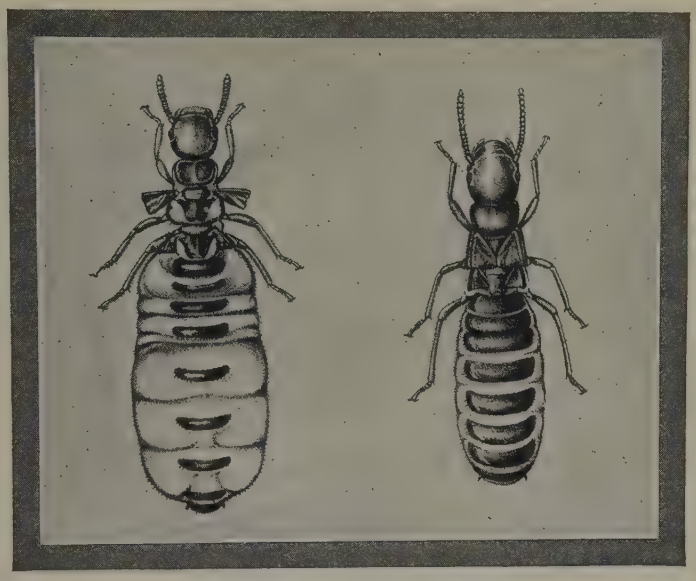


THEY LIKE TICKING, TOO

Much active eating has been done on a bolt of mattress ticking from which this was cut.

The U. S. Department of Agriculture receives many requests every year for information as to how to get rid of termites or "flying ants" which are damaging the woodwork of buildings in all sections of this country.

The winged "flying ants" during the annual swarm become a nuisance in buildings, the woodwork of which is infested. They often cause considerable surprise and anxiety to the inhabitants; the clumsy insects get into the food and crawl all over the table at mealtime. These winged termites occur in great numbers and are often swept up by the careless householder without further thought, being considered to be merely flying ants, probably coming from out-of-doors. It is not generally realized that they threaten the building as well as its contents. In reality, this swarm should be regarded as a warning and a danger signal.



A QUEEN AND A MERE MALE

This is an enlarged drawing of two members of the first form of termites, the queen at the left being mature with enlarged abdomen due to post-adult growth.

A prevalent idea, even among entomologists, is that termites only infest old buildings. As a matter of fact, it is not necessarily the age of a building but the manner in which it is constructed that renders it liable to attack. Improperly constructed new buildings one, two or three years old are often badly infested. Buildings constructed only for months are damaged and many recently constructed government buildings have been damaged due to improper flooring.

The remedy in case of our common destructive termites—*Reticulitermes*—is complete isolation or insulation of all untreated wood from the ground. Shut off from their necessary supply of moisture in the earth, those termites already infesting the woodwork will perish.

Termites that do not live in the earth cannot be combated as the subterranean species by shutting them off from their supply of moisture in the earth. They infest dry wood directly and do not require much moisture. Of course, their breeding places in decayed wood should be destroyed. Where these species are abundant—in the far southern states, southwest and Pacific coast—windows and doors in buldings should be screened, especially during the period of swarming or flight. In unscreened buildings the lights should be put out during the swarm. Fumigation with hydrocyanic acid gas will kill these termites in furniture, stored material or exposed timbers of small dimensions. This deadly gas should be used only by an expert. The woodwork of buildings should be treated with preservatives before the building is erected.

Studies of termites have been made for hundreds of years. While considerable progress has been made in describing the new species, and towards a knowledge of their biology, the data are as yet very far from complete.

It has been found that there is not only much variation in the habits of termites of the different genera but also variation due to differences of climate in various parts of the world. Approximately 1,500 different species are known.

"Anthropocentrisms" are always unsafe. Termites have brains, but they cannot be endowed with human intelligence, despite some facts at present unexplainable, such as the apparent "spirit of the colony" which may, however, merely be attraction due to the odor of body contact, and certain rhythmatic activities. It is doubtful if the workers exercise control over the life of the colony.

Among important facts yet to be determined in the biology of termites are the exact number of molts through which any caste of any species passes in its development, and what external and internal changes accompany these molts; the progeny of the different reproductive adults, particularly that of the intermediates; the mystery of colonization by the different types of sexual adults.

But little is known of the rôle of the various types of guests or inquilines in the termite colony—the so-called "termitophiles." In order to really study termites one must live with and observe them living both day and night. But what could be more fascinating than the study of the social insects! And to read the story of termite existence in its entirety is to solve a problem of outstanding importance.

THE THRESHER SHARK IS MOSTLY TAIL

Churning the water with this tail, which takes up about half its length, it will close in on its terrorized victims in gradually decreasing circles. Sometimes two or three threshers work in company at their mealtimes.

SOME SHARKS AND THEIR COUSINS

By Captain J. Menander
Of the Explorers' Club

(PHOTOGRAPHS BY THE AMERICAN MUSEUM OF NATURAL HISTORY)

SHARKS and their near relatives, the rays, were among the first fish to appear on the earth. The structure of their bodies is, consequently, in some respects primitive as compared with other fish. Their skeletons are of tough tissue, and the only bones present are the teeth. Yet during long geological ages these fishes have advanced to the stage of bringing forth fertilized eggs or living young.

Sharks are distributed through all the seas. Most of them live close to the surface, but some are found exclusively near the bottom. The body of the shark is more or less cylindrical, while the rays are flat. Many of the latter are specially fitted for life on the bottom. A few smaller forms have invaded the depths of the ocean and are found only below the 6,000-foot level. Sharks are most numerous in the tropics, but they are found all through the temperate zones. A few species live even above the Arctic Circle. They ascend certain large rivers and have been found hundreds of miles from salt water. One form is reported as a permanent denizen of Lake Nicaragua. In all about 150 species of sharks are known.

The feeding habits of the various species are plainly indicated by the structure of their teeth. Some, like the tiger shark and the great white shark, have large, flat, triangular teeth with sharp, smooth or serrated edges, adapted for cutting. Others, as the thresher shark, have narrow pointed teeth used for gripping and holding their prey. The teeth of sharks that live exclusively on small or minute animals are merely flat, bony ridges in the palate. The mouth of most sharks is placed on the under side of the head, and the animal must turn on its side to take food on or near the surface.

One of the smaller species is generally known as the dog fish. It is grayish in color and has a length of from two to four feet. This shark, which is common on the coast of temperate and tropical seas, is predatory and very troublesome to fishermen, taking fish caught on hooks or in nets and often tearing and destroying the latter. The most voracious of the smaller sharks is undoubtedly the spined dog fish. It is abundant in the North Atlantic, meeting in large schools and devouring other fish that flock together.

The thresher shark is mostly tail. The upper lobe is so elongated that it takes up one-half of the total fifteen feet of a grown-up thresher. It follows the schools of herring, menhaden, and other fish in their migrations, killing and devouring incredible numbers. While feeding, the thresher uses its long tail for splashing the surface of the water, while it swims in gradually decreasing circles around the school of fish. In their terror the victims keep crowded together. Sometimes two or more threshers may be seen working in company.

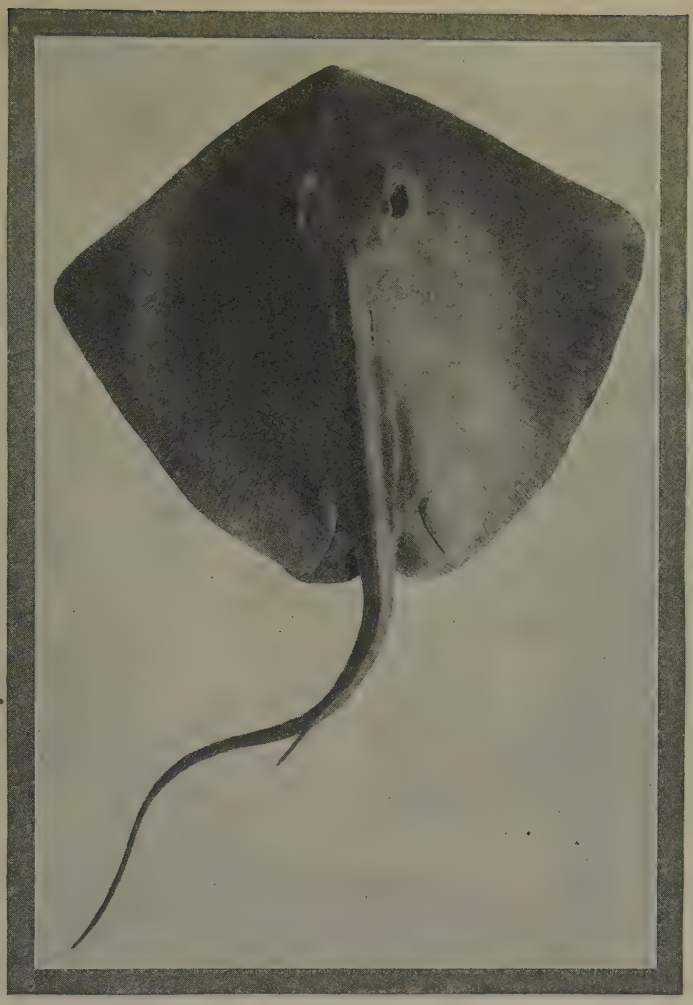
The hammerhead shark derives its name from its curiously shaped head. A large lobe is produced on each side of the head. From above, its head has the shape of a mallet, with the two eyes placed on the extreme edges. This peculiarly shaped head seems to act as a bow rudder, since the hammerhead is often seen to descend very abruptly to deeper water. This fish is found inshore in tropical and subtropical seas, where its favorite food in at least one case was proved to be sting rays. Dr. Gudger describes finding great numbers of bony stings from the tails of this ray imbedded in the tissue of the mouth and stomach of a hammerhead. The hammerheads attain a length of fifteen feet. One specimen, twelve feet and six inches long, measured three feet between the eyes.

The blue shark lives a solitary life at the surface of the sea far from land.

Spurred by the love of adventure, that boyish urge to seek the unknown and unexplored, young Johan E. Menander left his home in Sweden at the age of fifteen to go down to the sea in ships. He has followed the sea for thirty years, and out of the wealth of his experience comes this article and will come more.

It often follows sailing ships for days, waiting patiently for scraps of food to be thrown overboard. I have often watched it swimming lazily with the tips of its back fin and of the upper lobe of its tail protruding above the water. It is generally attended by one or more pilot fish, which is popularly believed to locate the food for its larger companion, and direct him to it, after it has been sampled and found palatable. This may be so, but in my opinion the pilot fish follows the shark simply because it is protected while in his proximity from enemies. This shark has its teeth arranged in rows, one behind the other, but only the the outer row is in use. The inner rows are folded back and covered by the membranes of the mouth. When a row of teeth has been worn out, it is discarded, and the next row is uncovered and raised ready for use.

The blue shark and its thirty-foot relatives, the white shark and the tiger shark, are known as "man eaters." I have never had the unpleasant experience of seeing a person attacked by a shark, but reliable cases of men having been mutilated or killed by sharks have come to my attention. It is not claimed that man is a preferred article in the diet of these sharks, but that he has been attacked simply because he happened to be handy.



THE BOTHERSOME STING RAY

This fish is found in tropical and temperate seas, using its strong tail as an effective weapon.

The basking shark, which reaches the same size as the white shark, is quite peaceable in its habits. Its mouth is of an extraordinary size and capable of great expansion. At one gulp the fish can take an enormous quantity of plankton, on which it feeds. The interior openings of the gill clefts are guarded by a kind of strainer which serves to prevent the food from passing out through the gill openings. The teeth are very small and without use in feeding.

THE HAMMERHEAD SHARK IS WELL NAMED

Its head is shaped like a mallet with eyes placed at the extreme edges of it. The head serves as a rudder when the fish descends into deep water.

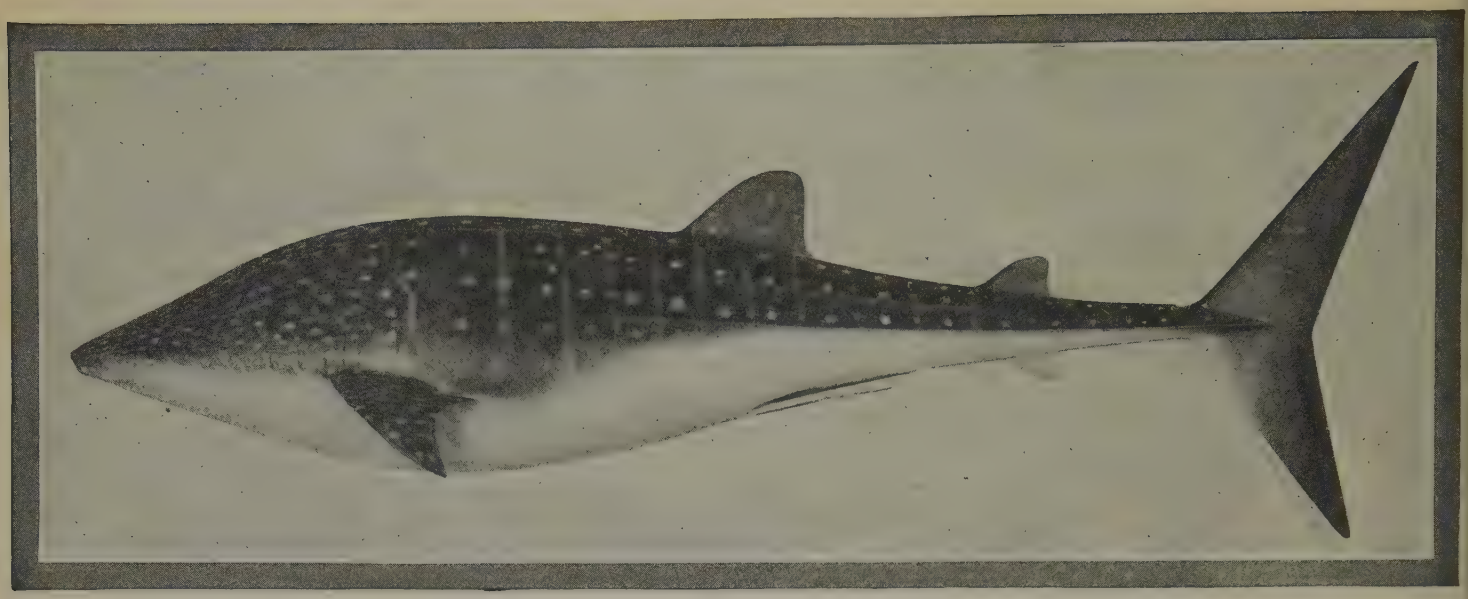
These sharks used to be numerous in the North Atlantic, but extensive fishing to obtain the enormous liver for its oil has greatly diminished its number.

The largest of all is the whale shark, which is reported to reach sixty to seventy feet in length. This enormous denizen of the sea is nowhere abundant, but seems to be most common in the western Indian Ocean. A few individuals have been found on the Florida coast. One specimen, captured near Knight's Key, Fla., is reported to have been forty-five feet long and twenty-three feet in circumference. The feeding habits of the whale shark are identical with those of the basking shark.

The saw fish is a ray, which retains the elongated form of the shark, with the tail as its sole organ of locomotion. The saw, which in large individuals reaches a length of six feet, is a flat prolongation of the snout with a series of strong teeth on each side. These teeth are sharp in front and flat behind, and are used to kill fish that serve for food. The saw fish is found in estuaries and mouths of rivers of the tropics. In some cases it is known to ascend streams for hundreds of miles.

The electric ray, also known as the torpedo or cramp fish, is equipped with an organ that generates an electric current. The back of the fish is positive and the underside negative, and circuit must be established between the two sides to deliver a shock. The fish uses this faculty both to defend itself and to stun or kill smaller animals, on which it feeds.

Sting rays inhabit tropical and temperate seas, but some are found in rivers as far as a thousand miles from the sea. The strong barbed spine on the upper side of the tail is a most effective weapon, by which the fish can inflict extreme-



A BROADSIDE VIEW OF THE WHALE SHARK

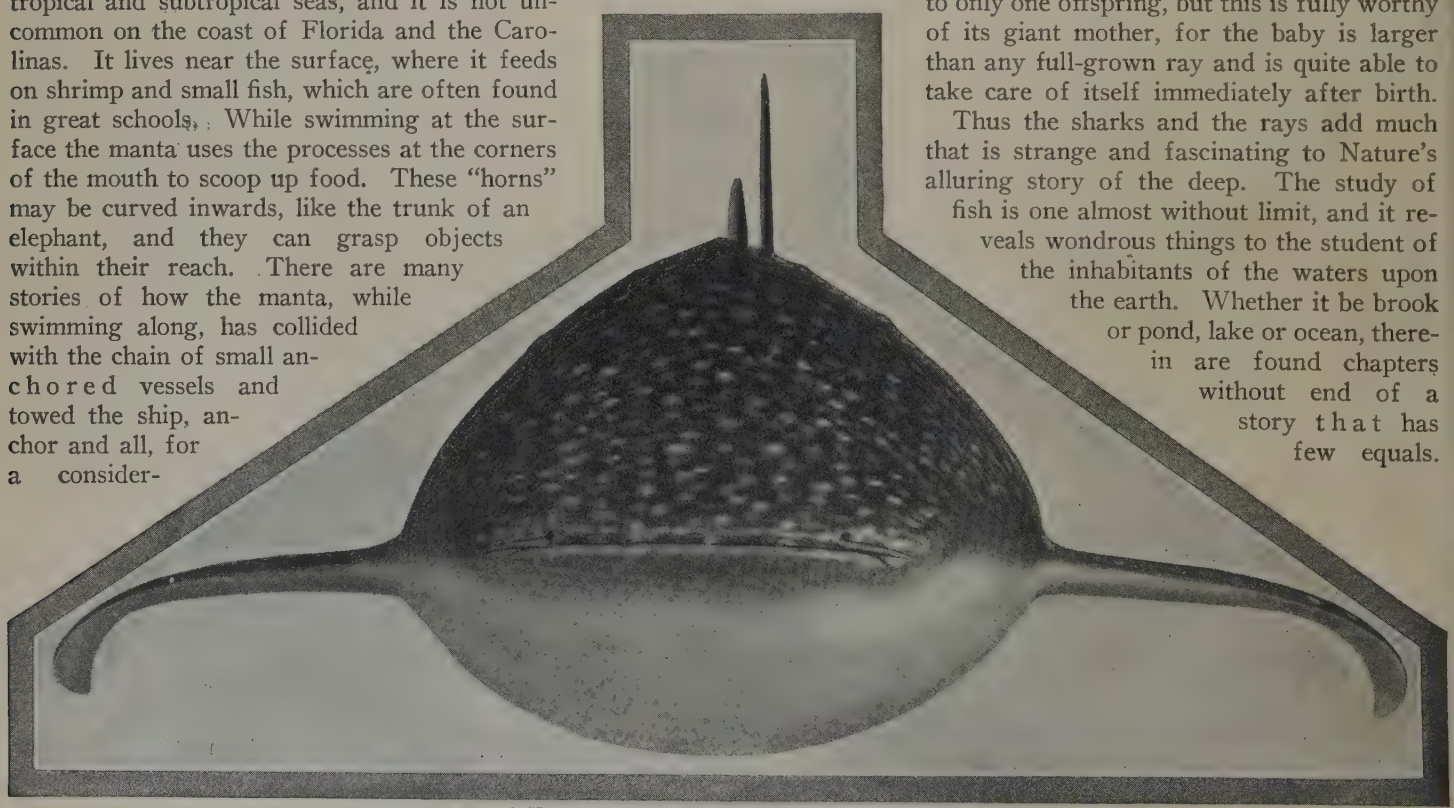
This Goliath fish feeds on minute and often invisible life in the water known as plankton, a menu out of proportion to its great bulk, for some of this marine life is even invisible to the naked eye.

ly painful wounds. It is believed that poison is injected with the sting, and the character of the wound invites infection.

The devil fish, or manta, is the largest and the broadest of all the rays. The body, exclusive of the tail, is about twice as wide as long, and it is supposed to reach the width of twenty-five feet. The tail is short and whiplike and only six-tenths of the length of the body. A long, flexible, hornlike process has developed on each side of the head, at the corners of the mouth. The mouth is placed in front of the head, contrary to the rest of the rays, and it reaches in large specimens the width of four feet. The manta inhabits the tropical and subtropical seas, and it is not uncommon on the coast of Florida and the Carolinas. It lives near the surface, where it feeds on shrimp and small fish, which are often found in great schools. While swimming at the surface the manta uses the processes at the corners of the mouth to scoop up food. These "horns" may be curved inwards, like the trunk of an elephant, and they can grasp objects within their reach. There are many stories of how the manta, while swimming along, has collided with the chain of small anchored vessels and towed the ship, anchor and all, for a considerable distance. A very singular characteristic of the manta is its tendency to turn somersaults. The turning over is done while swimming on its back, and is often accomplished at the very surface of the sea. First the feelers are seen emerging from the water, then the white belly and finally the tail.

The manta is often seen swimming just under the surface, lifting the tips of its winglike fins above the water. The most striking of its many feats is undoubtedly its leaps of ten feet clear out of the water. Contrary to many stories told, it does not attack man, but its huge size, batlike shape, and its many peculiarities while swimming have instilled a great fear among fishermen. It is claimed that it gives birth to only one offspring, but this is fully worthy of its giant mother, for the baby is larger than any full-grown ray and is quite able to take care of itself immediately after birth.

Thus the sharks and the rays add much that is strange and fascinating to Nature's alluring story of the deep. The study of fish is one almost without limit, and it reveals wondrous things to the student of the inhabitants of the waters upon the earth. Whether it be brook or pond, lake or ocean, therein are found chapters without end of a story that has few equals.



A HEAD-ON VIEW OF THE WHALE SHARK

This immense but not common shark is reported to reach a length of sixty to seventy feet. It is most abundant in the Western Indian Ocean, but a specimen forty-five feet long and twenty-three feet in circumference has been found off the Florida coast.

Forests of Chalcedony

By Guy E. Mitchell

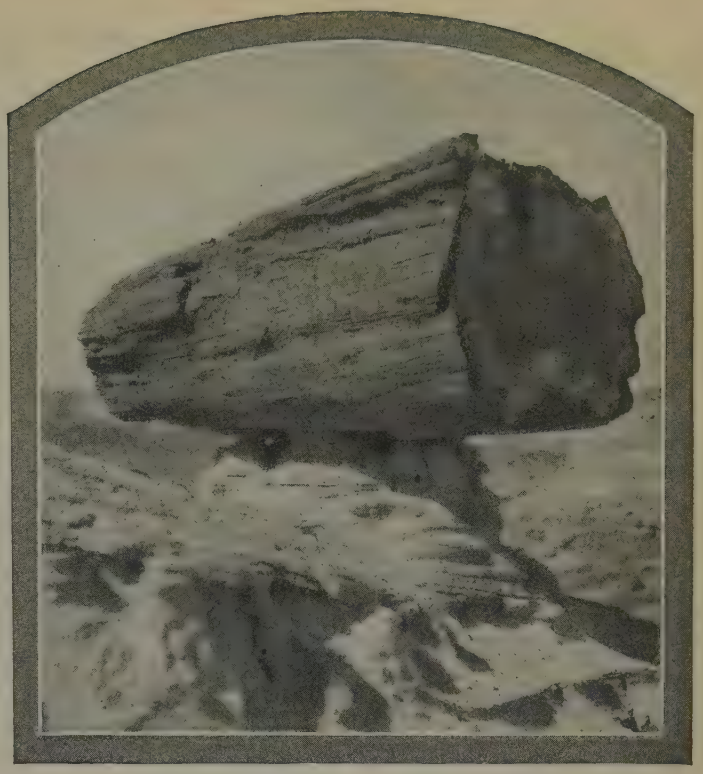
THE REMARKABLE fossilized trees of Arizona have been the theme of many wild and fanciful statements in which pure speculation and guesses have been generously intermingled with fact. The true story of these fossil forests, dating back some millions of years, is now told by government geologists who have delved into the past history of Mother Earth and traced back the ancient trees to their birth.

The "Petrified Forest" of Arizona, really a series of petrified forests, lies a short distance south of Adamana, on the line of the Santa Fe Railway. There are four "forests" included in a government reservation called "Petrified Forest National Monument," created by Presidential proclamation in 1906.

The name "forest" is not strictly appropriate, for the petrified tree trunks are all prostrate and are broken into sections. The logs are the remains of giant trees that grew in Triassic time, the age of reptiles, according to the United States Geological Survey. The trees were of several kinds, but most of them were related to the giant Sequoias—the Big trees of California, and to the Norfolk Island pine, now used as a decorative plant.

The petrified tree stumps in the Yellowstone National Park, and in some other places, stand upright in the positions in which they grew although covered in the long ago with hundreds or thousands of feet of dirt, which has since eroded, leaving them standing in the original ground in which they sprouted and grew. The logs of the Arizona "forest," however, are all prostrate. The trees grew in a nearby region and, after falling, apparently drifted down an ancient watercourse and lodged in some eddy or sand bank. Later they were buried by great deposits of sand and clay, finally to a depth of several thousand feet, completely excluding the air and preventing decay. Their conversion to stone came through gradual replacement of the woody material by silica in the form called chalcedony, deposited by underground water.

A small amount of iron oxides deposited at the same time has given the brilliant and beautiful brown, yellow and red tints which appear in much of the material. The sand and clay in which these trees were buried afterwards washed away, exposing them after millions of years of an historic burial.



SAW LOG OF MILLIONS OF YEARS AGONE

A petrified log in the fossil forest of Arizona left atop a pedestal of softer material after surrounding earth has been washed away.

Some of the tree trunks are six feet in diameter and more than 100 feet in length. In the first forest there is a fine trunk that forms a natural bridge over a small ravine, the water having first washed away the overlying clay and sand, and then, following a crevice, worked out the channel underneath. The length of this log is 110 feet, and the diameter four feet at the butt and one and one-half feet at the top. To support further this remarkable bridge, a concrete pier has been placed under one end of the log.

The petrified woods are beautiful objects for study. When thin slices are carefully ground down to a thickness of three-thousandths of an inch or less and placed under the microscope they show perfectly the original wood structure. All the cells are distinct, though now they are replaced by chalcedony through Nature's chemistry.

By studying these thin sections, F. H. Knowlton, an eminent botanist of the Geological Survey, has found that most of these araucarian trees were of the species *Araucarioxylon arizonicum*, a tree

THIS "FOREST" WILL NEVER BURN

Buried ages ago, their veins filled with chalcedony instead of the life sap of the tree, these logs are today the petrified forest of Arizona.

long since extinct. It is known to have lived at the same geologic time also in the east-central part of the United States, where the remains of some of its associates also have been found. These included other cone-bearing trees, tree ferns, cycads, and gigantic horsetails, which indicate the further interesting fact that at that time the rainfall of the southwest was abundant.

AN ANCIENT BRIDGE THAT NATURE BUILT

Spanning a small ravine, this petrified tree of long past ages has a length of 110 feet and a diameter at the butt of four feet.

The fossil forests that are found in Yellowstone National Park cover a considerable area in the northern portion of this beautiful playground. Travelling by saddle-horse through the valley of the Lamar River, the rider will see many upright fossil trunks in the faces of the walls which rise nearly vertically beside. These trunks occur at various heights, because were one to cut down into the mountain there would be revealed a succession of forests. Ages gone volcanic material engulfed the standing forest. Another grew, and came another pouring of lava, overcoming the second forest in turn. And so it went. Thus was Nature, through the thousands of centuries, loosing her forces to confound us and intrigue us.

The Arctic Puffin

THESE queer birds, photographed on the desolate shores of Spitzbergen, are found on both sides of the North Atlantic and in adjacent parts of the Arctic Ocean. They are called by many names; sea-parrot is perhaps the commonest. Pennant tells us that they were formerly extremely abundant on the coasts of England and Ireland where certain breeding grounds were considered very desirable property because of the value of the birds for food. The bodies, especially of the young, were salted and dried, and the flesh, being oily and somewhat rank, was reputed to be fish, and was so considered by the church.

One of the most remarkable features of this queer bird is the bill, which in the breeding season is ornamented with several plates of blue, yellow, and red, curiously grooved and embossed. These extra appendages are shed at the close of the breeding season, leaving the bill reduced in bulk, but retaining somewhat its characteristic and strange shape.

THE ARCTIC PUFFIN PHOTO KEYSTONE VIEW

This queer bird is known by many names, including sea-parrot and Ikey.

The nesting place is a burrow dug by the parents in the turfy soil on the summits of cliffs, or sometimes when the birds are much persecuted, deep in the cavities of rocks. The labor of digging the burrow is borne mainly by the male. On a few pieces of dried grass, or on the bare earth, the single large whitish egg is laid. Incubation lasts four weeks.

The young bird which is clothed with dusky colored down is fed for four or five weeks before it is able to follow its parents to the sea. While being cared for it is vigorously defended by the parents, which have an effective weapon in the powerful and sharp-edged beak.

Like many sea birds, however, the desire to accompany the departing flocks, when the autumnal migration takes place, sometimes proves too strong for the parental love of a mother bird, delayed in her breeding duties. Young ones thus deserted usually fall a prey to falcons or other predatory creatures near at hand.

GETTING THE HABITAT HABIT

By Paul Griswold Howes

Mr. Howes and his party have left for Dominica for a winter of absorbing study at his biological station there. An interesting phase of his work will be in the preservation of fish specimens collected. Mr. Howes has worked out a process of chemical baths that not only preserves the colors, including the eye pigment, of fishes, but also the colors of marine plants. This makes it possible to mount fishes in glass in natural surroundings and colors. The process has been perfected for northern climes and will be put to test under trying tropical conditions with brilliantly colored species.

NO ONE today doubts the enormous value of the habitat group as a medium of imparting accurate Nature knowledge. Next to actual first-hand field studies, there is nothing so graphic in its message to young and old alike. No written page stamps itself upon the developing mind as graphically as these man-made conjurings with the facts of Nature.

All of our leading museums, both in this country and abroad, are gradually turning to the group as their chief method of displaying the material gathered in the world-wide field activities of their staffs. Beginning in a small way many years ago, pioneers have been followed in this art. Now vast groups are constructed that illustrate whole zoogeographical trains of facts, local conditions, and faunas, that could be shown to the layman in no other way.

Modern museum groups are for the most part very costly. Artists must be employed to model in wax and glass. As only the highest accuracy is admitted in such work, it means hours and hours of tedious labor before the group even commences to take shape. The canvas backgrounds are large and expensive to execute, while those even greater ones painted upon semicircular walls of cement may run into thousands of dollars. The specimens within the group may mean the efforts of trained field naturalists, thousands of miles from home. From jungles and mountains, valleys and the Arctic snows, these specimens are secured at great expense, prepared in the field for shipment and later mounted at the museum by highly specializing taxidermists of the modern school. The detail of the big museum group is endless, and the difficulties to be overcome are often legion. But it must be remembered that many of the simpler groups, from a teaching standpoint, are just as valuable as those magnificent examples in our greatest museums.

A SIMPLE HABITAT GROUP

It represents a New England swamp scene and the accompanying article tells how such exhibits can be made.

The school group, constructed for the most part by the pupils, is entirely feasible and quite inexpensive, and at once excites the interest of the pupils constructing it. If they are made to observe the life of a chosen spot, their combined notebooks will at once supply the knowledge for the accurate construction of such a group.

The author has had occasion to experiment extensively with cheap and novel methods of group construction. Some of these processes are fascinating pastimes in themselves, and all are comparatively simple.

For the school habitat group, a cabinet should be secured about three feet long, three feet high and fourteen inches in depth. To be ideal it should have a glass door upon the front, and hinged, wing sides. The back should be removable and may be made of a single sheet of heavy card, or wall, board. The ideal case is clearly illustrated in the photograph on this page.

The removable back may be tinted light blue, or green, or painted with a scene representing the locality, a part of which is to be reproduced, should there be someone with that ability in the class. Sometimes a photo enlargement pasted down and then colored may be used.

The folding or hinged wing sides are convenient for holding descriptive labels telling about the group, and when open will admit light through the open sides of the case.

In the bottom of the case—upon its floor—a tray of wood with sides two inches high, should be fitted. The bottom of this tray should be strengthened by two strips of iron one-half inch or more in width and fastened across the grain by screws in order to prevent warping. In this tray the group proper is constructed, and it is thus removable from the case for study, and during the time that it is being constructed.

A small area of a swamp or woodland or field may be selected, and the plants and other vegetation copied by the simple methods given hereafter. Insects that have been previously mounted, as well as typical birds of the locality may be added from the school collection. A last year's nest may often be used and combined with them to good advantage. Care should be taken not to overcrowd the group. Select two or three typical and simple plants, the same number of insects or other interesting things found in the chosen area, a few of the dry grasses, dry leaves, twigs and refuse from the ground, two or three birds that have been observed inhabiting the site, and build the group on this simple plan.

WATER BIRDS IN WINTER

This is one of the groups at the Field Museum of Natural History in Chicago. It is a remarkably fine bird group and an outstanding piece of habitat perspective, as well as a valuable winter study of birds

MOTHER MALLARD PROMENADES

With her babies she floats on a tiny brook of shining celluloid between banks on which flourish a luxuriant growth of wax flowers and other conjurings of the scientists at the American Museum of Natural History.

MOTHER RENARD APPLAUDS THE YOUNGSTERS

This simple yet effective group is one of several habitats at the New York State Museum at Albany. The young fox is tussling with the morsel mother has brought home. This group is one of the type without background.

portar

A GLANCE AT THE NATURAL LIFE OF SANTO DOMINGO

This Rhinoceros Iguana group at the American Museum of Natural History in New York City illustrates the far-reaching scope of the habitat group, which transports not only wild life but foreign vistas to the stay-at-home.

AN INTIMATE GLANCE AT A BEAR FAMILY QUARREL

In the November issue R. Bruce Horsfall was shown in apparent danger of his life painting with a bear towering behind him. This is the finished group, mother bear resenting the intrusion of the father of her cubs. The group is one at Kent Scientific Museum, Grand Rapids, Michigan.

A group is like a painting. A little color, applied in a few bold dashes is far better than a lot of badly executed detail.

A neat wood packing case well painted will answer as a case if funds are lacking. After the case has been secured and the background painted or tinted and tacked in place, commence upon the plants.

For stems, use soft wire of different sizes, or better, the dried stems of the real plants if they are of a woody nature. To make them more natural, heat a little paraffin in a tin cup over an alcohol burner. When hot, but not smoking, add light chrome green (oil artist's color) bit by bit until of the proper color. Dark chrome may be used to vary the color according to the stem to be imitated. While the paraffin is still hot, brush it upon the wire or real stem with a soft flat brush, one-half inch wide, layer upon layer, until a natural appearance is secured.

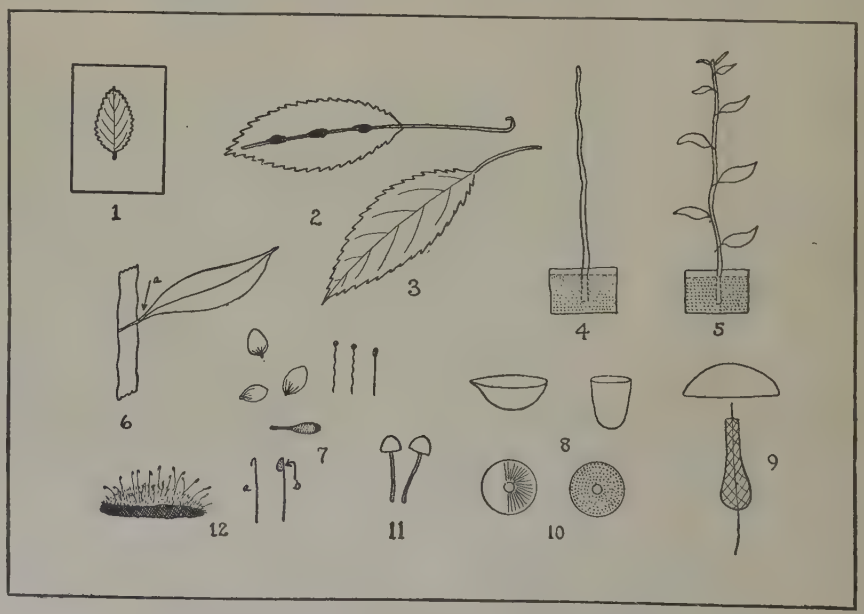
Next trace each leaf to be reproduced upon slightly absorbent writing paper. Cut out the leaves, and glue a very delicate piece of wire down what would represent the midrib of each. When the glue is dry, heat the green paraffin again and brush it upon the paper leaves, layer upon layer, holding the leaf by the end of the wire stem. You will be surprised and delighted with the simplicity of this method of leaf making, and will soon be able to produce excellent results. While the paraffin is still warm upon the leaf, trace the veins in it as they are in the natural one, using a long pin or needle for the purpose and bend or bow it into natural form before the wax is too hard and brittle. Yellow or red, or vari-colored leaves may be made by having several dishes of hot, colored paraffin and as many brushes, and applying the different colors one after another. To reproduce natural looking holes or irregularities, cut out a section of the leaf before paraffining it, and scorch the edges in the alcohol flame. For convenience, one may set the completed stems in little boxes of plaster of paris or in blocks of wood with little holes bored in them. This gives a convenient stand for the plant and simplifies further work upon them.

In fastening the leaves to the finished stems, have one of the natural plants before you, and copy it as nearly as possible in its leaf arrangement. If the stem is of woody material covered by wax, bore a tiny hole through it with a very sharp awl and insert the end of the wire which protrudes from the leaf, having first cut it off with the scissors so that it does not protrude through the stem. Just before inserting the wire end, dip it in LePage's glue. Thus the artificial leaves may be adjusted one above and [illegible], the smaller leaves, of course, being nearest the top.

Flowers are really too difficult for elementary work, but they may be made by patient, careful hands that are willing to copy the delicate petals in thin paraffin paper, and the other parts such as stamens and pistils with bits of delicate wire and little lumps of colored paraffin. "Soldering" in paraffin is a joy, and all one requires is a needle set in a match stick, and an alcohol flame. I have soldered leaves to paraffin stems and tiny petals on artificial chicken weed flowers with the greatest of ease, holding the tiny parts by means of a pair of tweezers. All one needs to do is to touch the parts to be joined with the warm needle and the thing is done. I always solder each leaf in this manner, where it joins the main stem, after the glue is dry. In the case of a paraffin-covered wire stem, I use the soldering method altogether.

Many grasses may be dried, then painted, and installed in a group without further preparation. Long waxed wires will serve for those with round stems. Fungi are easily imitated by filling small porcelain evaporating dishes half full of paraffin of the desired color. When hard, the dish is heated in hot water, when the form of the toadstool cap will come out very neatly. A stem is made by winding cotton about a wire and winding this in the shape of the natural stem with thread. This is afterwards covered with brushed-on layers of paraffin, and cemented, or "soldered" to the cap by means of the hot needle. Gills or pores are tooled, on the under side of the cap, and if the upper and under surfaces are of different colors, one or the other is brushed over with hot paraffin of the desired color. For delicate wires I use those of the florist which come in packages for holding bunches of violets together. Delicate copper wire is equally good and may be obtained in spools for ten cents.

Moss may be dried and the tips of it brushed with thin green oil paint. Moss fruits are easily copied by repeatedly dipping bits of bent wire in colored hot paraffin and painting the stems with oil color. Buds, and other vegetable forms may be made with cotton, wound with thread and coated with colored paraffin and painting with oil color. When the plants are finished, place them in the tray in the bottom of the group case, and fasten their stands in position with glue. Now in the same manner, fasten such twigs or nest branches firmly to the floor of the tray. The birds or animals may be placed on these branches or stumps either before or afterwards, but it is im-



FASHIONING THE VEGETATION OF THE HABITAT

The drawing shows (1) natural leaf on paper ready to be traced in pencil; (2) paper leaf cut out from tracing, wire glued to under side; (3) leaf coated with green paraffin, veins tooled in; (4) paraffined woody stem set in plaster stand; (5) same stem, showing methods of attaching leaves; (6) wire passed through stem and soldered with drop of green paraffin; (7) petals of thin paper coated with colored paraffin and stems of paraffin drops and bits of wire; (8) evaporating dish and small crucible used as moulds for caps of fungi; (9) moulded fungus cap and stem of cotton, thread and paraffin, wire through center; (10) reverse side of wax caps of fungi, showing pores or gills made with needle; (11) small toadstool caps moulded in thimble, stems of paraffined wire; (12) natural dried moss touched up with green paraffin, and moss fruit, made by dipping bent wire (a) in hot green paraffin until the ball (b) forms.

portant that they be firmly fastened down to the case bottom.

When these things are in place, fill the tray with plaster of paris or asbestos cement, being sure to cover the stands which hold them in place. See that the surface of this material is rough and uneven like the ground surface, before allowing it to dry. When dry it may be colored with burnt umber and green and other oil colors, applied with a brush, until it appears natural. Varnish will give a wet finish.

Snow may be represented in a permanent group by sifting on common salt or sugar. It is very realistic and soon forms a natural crust. In a portable group I use pure white hot paraffin splattered from a stiff bristle brush. Insects, leaves, seeds, and other natural touches may be fastened in place with glue, and it is in these little simple finishing touches that one finds the keenest pleasure.

Let the group, however tiny and simple, represent one or two biological facts or relationships that are true of a locality, and it is at once worthy of a place in the teaching of nature.

Toad of the Garden

NONE MAY say where he spent the long sun-filled hours—for the reason that none knows. He is the toad of the garden, and twilight is his hour. Perhaps if you were to part at noon the tangle of berry vines, now light as young grass, now dark as emerald, you would descry his retreat in the cool and pleasant mold where the canes run to soil. Or if, as slim as a ferret, you might slip between the palings of the porch, you were likely to find him blinking in his form of clay, the most comfortable fellow for miles around. But it is only when the ruddy globe of the sun slowly retires beyond the hills that he hops abroad.

He that was vocal and musical enough in March, when the ponds were swollen with rains, is silent and reserved in August—a meditative amphibian given to lonely rambles. The quack-grass stirs at the garden edge, there is the faintest rustle of stalk against stalk, a mouse-like sound that stirs the cat to glare. And into the half light enters Warts himself, now striding with long, ungainly reaches of his stubby webs, now hopping with the port and dignity of paunch—a figure as weird and impossible, in miniature, as any that ever strode or floundered from the ancient ooze to haunt the margin of lakes. Fearsome is his mission, for he purposes to dine by the way, but to a casual eye there is nothing of terror in his aspect. He is the toad of the garden, whose gravity is indeed ludicrous.

"A ROUGH MORSEL"

"Warts cuffs and rubs one fingered palm against his most capacious mouth."

"WARTS IS ON PATROL"

"Dusk is heavy over the garden, there is the faintest rustle from the darkness."

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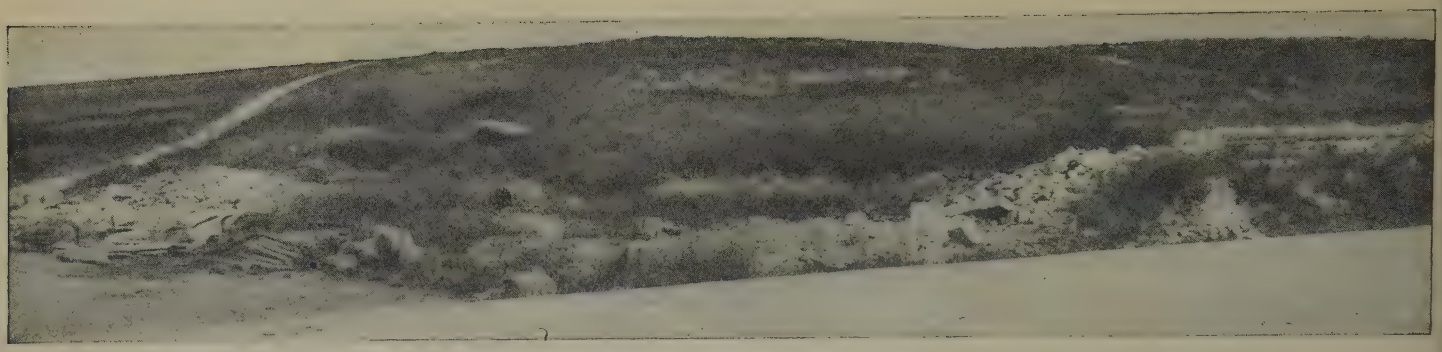
Puss is no longer interested. What are toads when there are field mice afoot? Curiously the vivid eyes mark his slow progress down the lane of beets, then turn with keener light, and boding, towards a sound too far and finely pitched for all save puss. The cat melts into dusk as one of dusk's own shadows, soft-footed, silent, and is gone. Somewhere past the corn there is hunting. Grief will come to the scamperers who venture to forage in this province. Our amphibian is motionless now, a clod against the darker soil—a clod that presently quivers and stretches slow limbs to the careful business of stalking. Too instant and indistinct for the eye to catch was that flicker of tongue, but in its sufficient brevity it was kismet to some wandering moth or prowling beetle.

A rough morsel that must have been, for Warts has reared from his squatting posture, and cuffs and rubs one fingered palm against his most capacious mouth. Ah, it is down—the hunt begins again.

The toad in the garden, though no adage proclaims the truth, brings luck to the gardener. He is the nemesis of every form of harmful insect, and not less than Nimrod, is a mighty hunter in the sight of the Lord. . . . Dusk is heavy over the garden; there is the faintest rustle from the darkness. Warts is on patrol.

B. H. L.



WHERE ONCE STOOD A FOREST NEAR VERDUN

Pepper Hill, swept for four years by terrific fighting which left behind it a trail of devastation. The ground itself must be reclaimed before seeds or seedlings of new forest can be planted upon it.

France and Her Forests

By Richard W. Westwood

"C'EST TRISTE!" He was standing, this French gentleman, on the brow of the hill where once was Douamont. His glance wandered toward the sacred city of Verdun, and then around the circle of rolling country and gentle hills. Only scrubby, gnarled growth and graying grass hid the shell-scarred face of the land.

"It is sad," he repeated. "As a boy I have played in the forests that once grew here. I have followed my father, my brothers and their dogs at the season of the hunt through these hills. We have eaten our dejeuner just there—no, perhaps there—where once was a thick pine forest. What work and patience it means so that trees once more shall grow here!"

There was nothing for me to do but nod in agreement that it was sad, and to think of the millions of waste forest land in our own country, devastated by fire, by carelessness, or left fallow from indifference.

The war has willed to France a forest task. It has, perhaps, been lost sight of in the recitation of other losses. Among other economical and financial problems the issue of France's future timber resources hardly stands out except in the minds of foresters. Its settlement, however, promises to be somewhat of an object lesson to timber-prodigal nations of the world. It is of direct and vital interest to every foresighted American.

The fundamentals of the constructive forest policy of France have remained virtually unchanged, save for the brief period of the Revolution when all regulation irked, since the days of Colbert and the ordinance of 1669. There are today, however, three new factors. The problem of the devastated and partially devastated forest lands is the foremost. The new questions connected with the acquisition of the forest areas of Alsace and Lorraine are another, and the third has been the temporary question of French forest operations in the occupied area.

In 1914 the forests of France totaled 24,420,000 acres, of which about 30 per cent were owned and operated by the state and the public bodies. Yet at that time the nation was forced to import for her needs a net 160,000,000 francs' worth of timber. The production of her forest areas was insufficient then. It is even more so today, conjuring up a problem which requires, for its successful solution, clear vision and effective cooperation.

CARRYING a message of friendship and common appreciation of the vital importance of trees and forests to a nation's prosperity, millions of seeds are today crossing the Atlantic to take root in the soil of France, England and Italy. Tiny forebears of future Douglas Firs and Sitka Spruces, these seeds are being sent by Mr. Charles Lathrop Pack, president of the American Tree Association, his fifth shipment, to help in the task of replanting acres devastated by the tide of war or cut to meet the demands of conflict.

To England go the seeds of the spruce, which prospers mightily in the soil of the British Isles. To France and Italy go both spruces and firs, the latter having proved itself a worthy immigrant to France, promising a strength and beauty of growth that compares with its achievements in our own northwest. To France and Italy, also, Mr. Pack is sending small shipments of a score of other varieties. These will be distributed to the various experimental stations and schools in these countries for studies and tests of their use in foreign soil.

This gesture of comradeship seven years after the close of the World War may well turn our attention for a moment to the forestry problems of France. From the way she is meeting them, the United States may draw some lessons, suggested in this article.

Not alone in the theater of hostilities, but virtually throughout France, the forests felt the effects of the war. From the Vosges to the Somme, in the "red zone," the destruction was more or less complete. As at Verdun, at Hartmanswillerkopf in Alsace, and at la Chipotte in Lorraine some forests have entirely disappeared. Other forests have been sorely wounded, such as those in the Argonne, in Champagne and Valois.

Behind the lines, as well, the demands of war are the problem of supplying the armies of France and her allies, placed a heavy drain on the forest resources of the country. In the early days of the conflict there was much waste. Timber was cut out by the military without regard to sound forestry. Foreign lumbermen, accustomed to prodigality and to cutting a tree a foot or two above the ground, were frequently engaged in forest work. Gradually, however, this situation was met by the organization of a definite forest policy for the army. But even the timber resources exploited under regulations were called upon "to give until it hurt," and the hurt still remains today.

IN THE FOREST OF VILLERS-COTTERETS

This is one of France's most beautiful forest areas where a process of reclamation is going forward, clearing away the battered nd dead trees in order that the healthy ones may grow and add to France's timbered areas.

In the regions held by Germany, exploitation of the French forests was carried on without measure or order except to satisfy the needs of the German Armies. In many sections areas were razed obviously with deliberate view to the economic upset of France.

It is estimated that 500,000 acres were stripped entirely of productive timber. Of this area about one-half presents a plain problem of reforestation. The other half must be the object of extensive reclamation of the soil before it can be hoped to grow trees. Another 375,000 acres, victims of abusive, premature or vicious exploitation, must also be reforested. From all of these 875,000 acres, according to the Administration of Waters and Forests, no return to their former productivity can be expected before sixty years have passed.

France is going forward as best she may to meet the needs of the present and to anticipate those of the future. Particular attention is being directed to the reclamation and rehabilitation of those forests which still have the appearance of timber lands. In the forests of Villers-Cotterets and Compiegne, for example—both of which suffered during the operations in 1918—trees already dead and those doomed by mortal wounds from shell fragments and machine-gun bullets are being cut out. But with homes yet to be built, mines to be reclaimed, roads improved, and with man power low and finances unsettled, the task of reclaiming the shell-churned areas has scarcely begun.

A definite policy has been worked out, however, prescribing measures for the recouping of France's forest losses and for the easing of the present drain upon her existing resources. This program is divided into three parts. It includes measures which produce more immediate results, those which will be effective within a reasonable length of time, and those for the future.

As immediate measures a revision of the cutting regulations prevails for a time in the forests where larger trees are abundant. That is, a more complete use of larger trees is being observed within the bounds of sound administration. Judicious use of all available timber is being fostered. This is particularly evidenced by the care with which all the wood that went to build dugouts has been gathered to relieve the firewood demand. Education in the use and against the abuse of timber is being carried on.

For the more immediate future the program calls for exploitation and improvement of the colonial forest resources of France. It includes intensive activity in the rehabilitation of the mountain forests. A third measure provides for the recreation of poplar plantations, which will give wood for various lines of industry within twenty-five or thirty years. What American lumberman would not gasp with dismay at the very thought of being forced to use a wood so despised? Yet in following this course, France is but showing us the result of the very policy of forest destruction which we Americans as a whole so blindly pursue.

Looking toward the future, however, France's forest policy is more far-reaching. First comes the reforestation of the devastated areas, through a special reconstruction service which will create nurseries along the old front and attempt particularly to introduce into this area new types of trees, either native or foreign, to the end that the development may be as intensive as possible. Attention will be turned to the foresting of areas not now producing, particularly lowlands

and swamps, with a view to encouraging the growth of resinous trees and others of medium size.

More intensive silviculture will be practiced, with the maintenance of larger reserves of bigger trees and the conversion of areas now devoted to growing chiefly smaller trees into big tree domains. More intensive and diverse planting of roadsides and canal banks is planned. Acquisition of larger areas by the state, particularly in the devastated areas, is proposed, for the state rather than any private individual can best afford to wait for returns from slow-growing trees. State cooperation with the private owners of timber lands, encouraging these owners and advising them on the best means of making their crop-growing profitable, is to be carried forward.

Extending somewhat the power of the administration, a new law has been passed recently under which the administration can exercise a check on private owners. This statute authorizes the Department of Waters and Forests to designate privately owned areas as protective forests and to require the submission and approval of a plan of cutting before the owner is allowed to operate.

The forest domains of the three departments into which Alsace and Lorraine have been divided constitute an interesting phase of the present forestry situation. By the acquisition of Alsace and Lorraine, France came into approximately 1,090,000 wooded acres. About two-thirds of this acreage is owned by the state or is under communal or other public control. Under German sway these forests were administered by a commission, which followed out a policy of maintaining a wood-cutting organization and selling timber.

With the necessary slowness of post-war adjustment it was only two years ago that the forest areas of this section came under the direct supervision of the French Director-General of Waters and Forests. It is planned that the Alsatian system of maintenance and exploitation will be changed very slowly, if at all. It is the conviction of the French that the present organization is functioning successfully. The forest resources of Alsace and Lorraine really represent no addition to the supply needed by France as a whole, almost the entire production being consumed locally.

In the Rhine regions of occupied Germany the French system of forest administration and cutting is being followed out. Evidence fails to support charges that the French are revenging themselves on the German timber lands with wholesale forest destruction on the careless American plan.

It is interesting to note that the French foresters are not touching the communal forests planted in Germany by Napoleon I. It is innate in a Frenchman not to spoil a forest deliberately, and the cutting that is going on in the occupied areas is being done only in the forests of the Reich and with a complete regard for constructive and conscientious forestry.

It appears to be the firm and general conviction of French foresters that, although France's timber resources were hard hit by the war, the situation has greatly strengthened the public appreciation of the fundamental need of foresting for the future. Out of the exigencies of conflict and the stringencies of the post-war problems, it is felt, will come an even firmer policy and more general future cooperation.

AMONG THE BLUE HILLS OF ALSACE

These wooded mountainsides in the Valley of Thann are a part of France's rewon forest areas. Hartmanswillerkopf is to be seen in the distance. Heavy fighting throughout the war destroyed much of the timber on its slopes.

Phantoms of the Air

By Charles Fitzhugh Talman
United States Weather Bureau

PETER BELL, whose name has become a proverb because a primrose by a river's brim was nothing more to him than a yellow primrose, had a certain advantage over a host of his fellow-mortals, including, perhaps, some poets. He knew a primrose when he saw one. He did not mistake it for a buttercup or a dandelion.

There is real pleasure, even for those who lack the poetic vision, in knowing by sight and being able to call by their names the common objects of the outdoor world. Thanks to "Nature study" such knowledge is much more general nowadays than it used to be. There is, however, one large group of natural phenomena, quite easy of observation, with which most people have a very limited acquaintance. Scientifically, these things are called photometeors, and the branch of formal knowledge dealing with them is known as meteorological optics. Non-scientifically, they might be called "phantoms of the air." They are not tangible objects, like flowers and birds and butterflies. They are the appearances due to the effects produced upon light by the atmosphere or by its liquid and solid contents, in the shape of water drops, ice crystals and dust particles.

The diversity of these phenomena is little realized. For example, the average person thinks of the rainbow as a thing subject to little variation, apart from being sometimes single and at other times double. As a matter of fact, there are many kinds of rainbow, and there is so much of interest to be said about them that we shall reserve the subject for another occasion.

Take, again, the "ring around the moon," or the equally common but less often observed ring around the sun. If the ring is of the sort seen in fleecy clouds, consisting of a broad band rather close to the luminary, mostly brownish red but sometimes showing other colors, it is a corona, formed by the diffraction or bending of the rays of light around the small drops composing the clouds. Coronas vary in size and coloration, but hardly exhibit distinct types that admit of classification. An exception to this statement is the very large corona, due to fine dust in the atmosphere, that has been seen after great volcanic eruptions and is known as "Bishop's ring."

If the ring around the sun or moon is a narrow circle of larger radius than the ordinary corona it is a halo, due to the refraction or bending of light which passes through ice crystals. In our latitudes these crystals usually form a veil of lofty cloud, but in the polar regions bits of ice floating in the air close to the observer

DRAWING AFTER LOCKYER

THE DELUSIVE "WATERS" OF THE DESERT

The oasis that is never reached, the theme of many a traveler's tale and of many legends of the Orient.

may give rise to halos of many kinds. Both coronas and halos formed about the sun generally escape observation on account of the dazzling brightness of the luminary. Anyone who is interested in seeing these things should seek them with the aid of smoked or tinted glass, and it is further advisable to stand in such a position that the sun is screened by the corner of a building or some other object.

Now we come to the point of special interest. The common halo, which is called, with reference to its radius, the *halo of 22 degrees,* and which may be seen about every three days on an average, is one of a large family of halos, most of which are altogether unknown to the world at large and unfamiliar, to say the least, to the majority of scientific men! A few years ago the ignorance concerning solar and lunar halos that prevailed in scientific circles was little short of a scandal. At a meeting of the British Astronomical Association, for example, one of the members described a certain halo that he had seen—a variety not at all uncommon in the British Isles—and the discussion revealed the fact that nobody present could call it by its name or had, apparently, ever heard of such a thing! At present halos are better known to the English-speaking world, mainly because of the publication in the July, 1914, number of the *Monthly Weather Review* (issued by the U. S. Weather Bureau in Washington) of an article by Dr. L. Besson entitled "The Different Forms of Halo and Their Observation."

While all halos are due to ice crystals, some are caused by the refraction of light passing through the crystals and others by the reflection of light from their surfaces. Differences in the shapes and positions of the crystals account for the great variety

FATA MORGANA

A classic drawing of this form of mirage, as observed on the coast of Greenland by the famous Arctic navigator, William Scoresby.

of halo forms. The halos caused by reflection are white. Those caused by refraction are colored, but in the case of lunar halos the color is sometimes hardly noticeable on account of the feebleness of the light. Most halos are circles or arcs of circles. Some are concave and some convex to the sun or moon, while yet others pass through the luminary. Besides these arcs and circles there are halos in the form of luminous spots, either colored or white. These include what are popularly called "sun-dogs" and "moon-dogs."

Halo-hunting is a sport that can be recommended to the amateur. The article by Besson (now out of print) is an excellent guide to this pursuit, which opens up a wonderland the very existence of which few people suspect. Several forms of halo have very rarely been observed, and there is, in many cases, a good deal of uncertainty about their details. Hence an accurate description of one of these rarities is a real contribution to science. The observation of such a halo is a more thrilling experience than the acquisition of a rare coin or postage stamp, already perfectly well known to collectors. Once in many years in our latitudes, and frequently in colder climates, marvelous combinations of halos may be seen in the sky—so-called "halo complexes." One of the most remarkable displays of this kind in the history of science was seen, in different degrees of development, over the eastern United States on November 1 and 2, 1913. Of the hundreds of thousands of people who saw these wonderful things in the sky how many could name their various features—or even knew that they were halos?

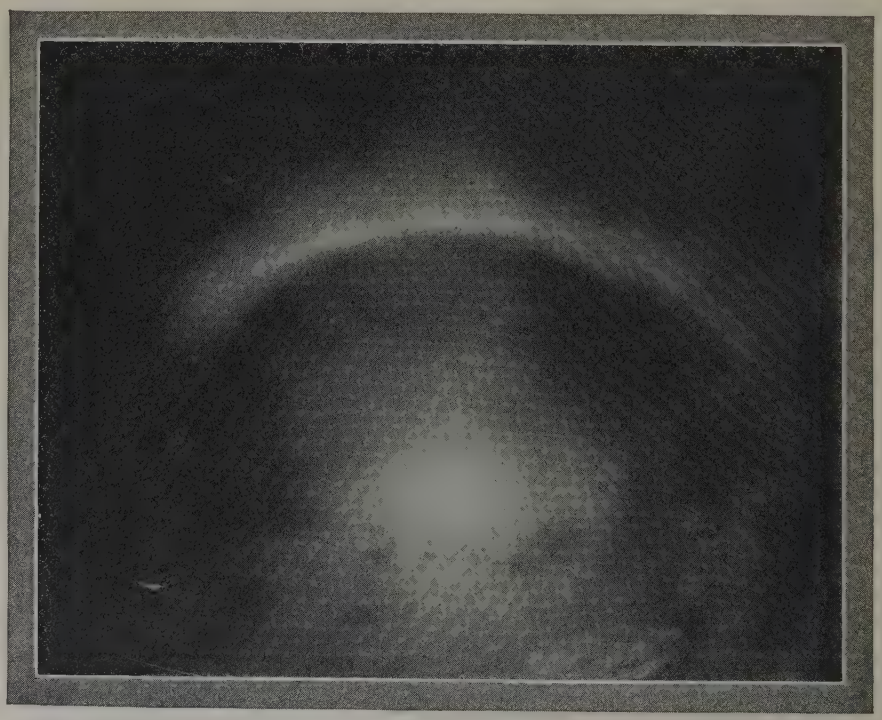
Let us turn, now, to another class of optical phenomena, very different from halos, but equally strange and interesting. They are known collectively as mirage. The latter term suggests to everybody's mind an apparent pool of water in the desert, as so often shown in schoolbooks. In fact, the subject of mirage was first made generally familiar by the experiences of Napoleon's soldiers during their campaign in Egypt, and by the scientific descriptions of the French physicist Monge, who accompanied the expedition. The same kind of mirage that occurs in the desert can, however, be seen nearer home. On a torrid summer day, if your eye is at the right level, you will perceive equally delusive "water" overlying a stretch of asphalt or concrete pavement.

All kinds of mirage are due to the bending of rays of light by sharply contrasted differences of density between adjacent layers of air. These, in turn, are due to differences of temperature. The desert mirage is the result of the formation of a shallow layer of warm, rarefied air over ground heated by sunshine. This layer acts as a mirror, and the apparent water is a reflection of the sky. The unsteadiness of the heated air often gives an appearance of ripples, and the effect is made still more realistic if trees or other terrestrial objects are reflected along with the sky. Very different effects are produced by the formation of a layer of abnormally dense air over a cold surface, such as water or ice. In this case, if the observer is within the dense layer, he may see an inverted image in the sky of some distant low-lying object, such as a ship, or he may see two images, one inverted and the other erect. Taller objects, such as hills and mountains, extending above the dense air will seem to be lifted above their true positions; a phenomenon known as "looming." There are other possible arrangements and combinations of warm and cold layers, including, for example, the occurrence of an abnormally warm vertical layer adjacent to a wall or cliff, which gives a distorted appearance to objects seen through it called "lateral mirage." Lastly, a mixture of masses of air of different densities may give rise to the complex phenomenon of Fata Morgana.

DRAWING BY H. GROSS

PHANTOM BALLOONISTS

This example of the Brocken specter was drawn from nature by a German aeronaut.

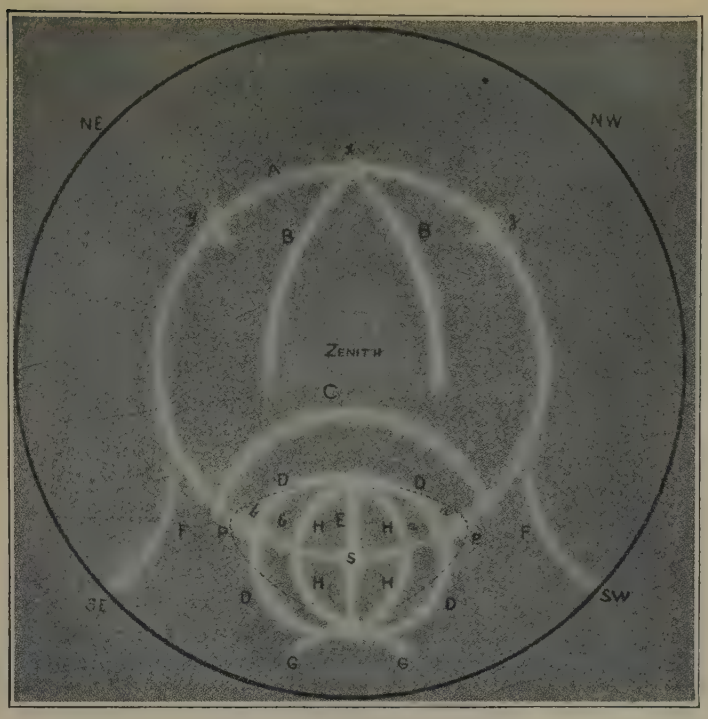


PHOTOGRAPH BY R. B. HOIT

THREE MEMBERS OF THE HALO FAMILY

The two large arcs are parts of the elliptical "circumscribed halo" and the circular "halo of 22 degrees." Part of the parhelic circle, which passes through the sun, is indistinctly visible.

Mirage is a familiar sight to sailors, and its observation probably explains the legend of the Flying Dutchman and some of the other strange tales of the sea. There are accurate descriptions of the phenomenon that read like fairy tales. William Scoresby, Jr., the Arctic voyager, has left us a vivid account of seeing his father's ship inverted in the sky. With his glass he could make out the details of masts and hull, though the vessel was thirty-four miles distant and nearly fifteen miles beyond the horizon. Mr. C. A. Reeds has recorded the case of a ship that was expected to arrive at New York from England during the Colonial period. He tells us that "on a Sunday afternoon, after a violent storm, she was seen floating in the air, every spar represented so clearly that there was no question of the identity of the vessel thus painted in the clouds; but that was the last ever seen of the ill-fated ship."



HALO OF NOVEMBER 1, 1913

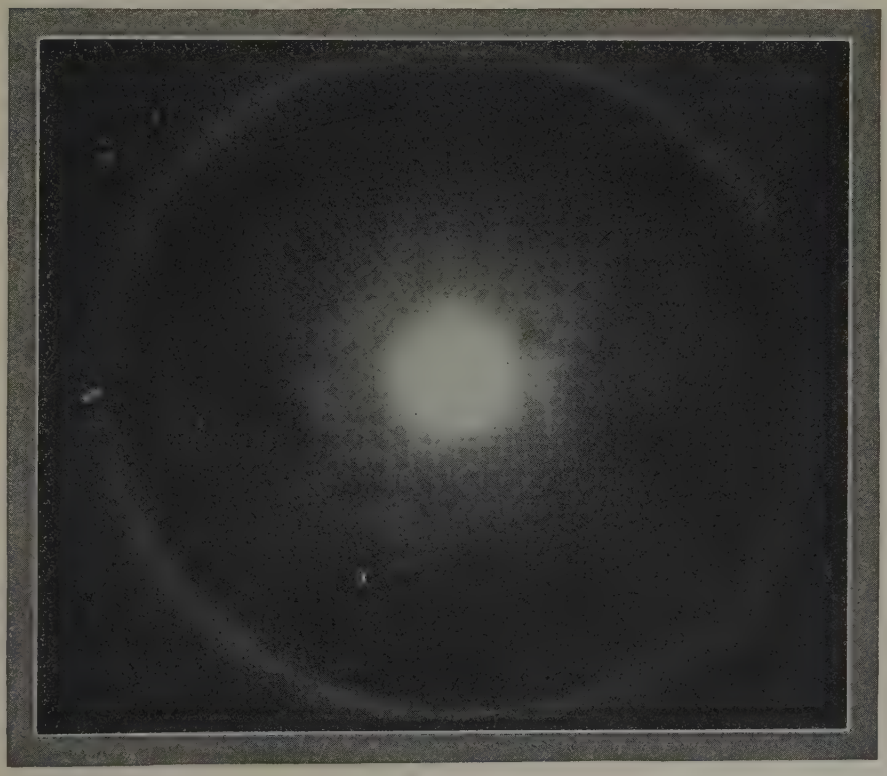
This is the halo as seen at Springfield, Missouri. The black circle is the horizon and S represents the sun.

In the history of polar exploration there are two cases in which mirage gave rise to faulty geography. In the first case Commander Wilkes was led astray by mirage and charted the coast of the Antarctic continent in the wrong place, thus starting a controversy that raged among geographers for generations. The second case was that of the mythical "Crocker Land," which Peary thought he discovered in 1906. After it had figured on the maps for some years it was proved to be non-existent, but the expedition that went north to explore it observed the same mirage by which Peary had been misled.

The traditional home of the Fata Morgana is the Sicilian shore of the Straits of Messina, as viewed from Reggio, in Calabria. Many descriptions have been published of the phantom city, with its innumerable towers and palaces, that is occasionally seen at this place, and that bears the name of King Arthur's sister, the enchantress Morgan le Fay. The appearance is merely a much distorted image of objects across the straits seen through variously heated masses of air, and similar spectral cities are sometimes observed in other parts of the world. Some of the most striking examples of this phenomenon have been found in the Arctic and Antarctic, notably along the coast of Greenland, where such appearances were observed and drawn long ago by Scoresby.

There is another kind of atmospheric phantom that was orginally associated with a single locality but was afterward found to be of widespread occurrence. This is known as the specter of the Brocken. From the summit of the German mountain to which it owes its name, and from many other mountains as well, an observer often sees his shadow cast upon a bank of fog or cloud. The shadow is sometimes surrounded by colored rings of light, due to reflection and diffraction, called the glory or Brocken-bow. The sun must be low at the time of observation and the fog bank close at hand. The distance of the latter is, however, generally much overestimated, and as the observer thinks the shadow is far away he has the impression that it is of gigantic size. The Brocken specter is also seen from aircraft, and this may happen when the sun is high. The shadow of the balloon or aeroplane is then cast upon a horizontal surface of cloud below the observer. Brocken specters are occasionally formed by moonlight.

Such are a few of the many strange phantoms that haunt the air. It would take a much longer article than the present one to describe them all.



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A PHANTOM BORN OF ICE CRYSTALS

A remarkable photograph of the circumscribed halo, as seen around the sun on May 20, 1915, at New Haven, Connecticut.

CHAP. 171.

Of the Gooſe tree, Barnacle tree, or the tree bearing Geeſe.

Britanicæ Conchæ anatiferæ.
The breed of Barnacles.

Many are the strange tales that writers of former days wove about the facts of Nature. So founded in literature and common acceptance were many of these that they lived long and even still persist. To the left is a drawing setting forth the fabled origin of a certain species of goose, which was supposed to emerge from a barnacle. The accompanying article illustrates the finality with which these writers of several centuries ago gave their knowledge of Nature to the world.

THE BARNAKLES WHOLE FABULOUS BREED

By ELLIOT SNOW
Captain, C. C., United States Navy

ONE OF the most extraordinary and persistent myths of medieval natural history is that which concerns the origin of a species of goose. The tale itself dates back at least to the twelfth century. The particular goose is a winter visitor to Britain and is now known to have its nesting place in the Arctic. As late as the middle of the seventeenth century, however, the nesting place, habits and life cycle of the bird remained a mystery.

The *Encyclopedia Britannica* tells us that the "barnack" or "bernacle goose" was fabled to originate within the shell-like fruit of a tree growing by the seashore. One version of the story is that this shell grew as a kind of mushroom on rotting timber in the sea. This referred, probably, to one of the barnacles of the genus *Lepas*. But even after the scientific study of zoology had replaced the fabulous tales of the medieval writer, the story persisted and was strengthened, no doubt, by the transferring of the name of the sessile barnacles to this species of goose.

Browsing one day about the library of the Navy Department I came upon an entertaining volume. It was "Gerarde's Herball—very much enlarged and amended by Thomas Johnson, Citizen and Apothecarye." It was published in London in 1636. Therein the learned writer takes on a quaint Nature Study trip and intrigues us with an introduction to the Goose Tree and its feathered fruit.

"Having travelled from the Grasses growing in the bottome of the fenny waters, the Woods and mountaines, even unto Libanus it selfe; and also the sea, and bowels of the same wee are arrived at the end of our History; thinking it not impertinent to the conclusion of the same, to end with one of the marvels of this land (we may say of the World). The history whereof to set forth according to the worthinesse and raritie thereof, would not only require a large and peculiar volume, but also deeper search into the bowels of the Nature, than my intended purpose will suffer me to wade into, my sufficiencie also considered; leaving the History thereof rough hewen unto some excellent man, learned in the Secrets of nature, to be both fined and refined; in the meane space take it as it falleth out, the naked and bare truth, though unpolished.

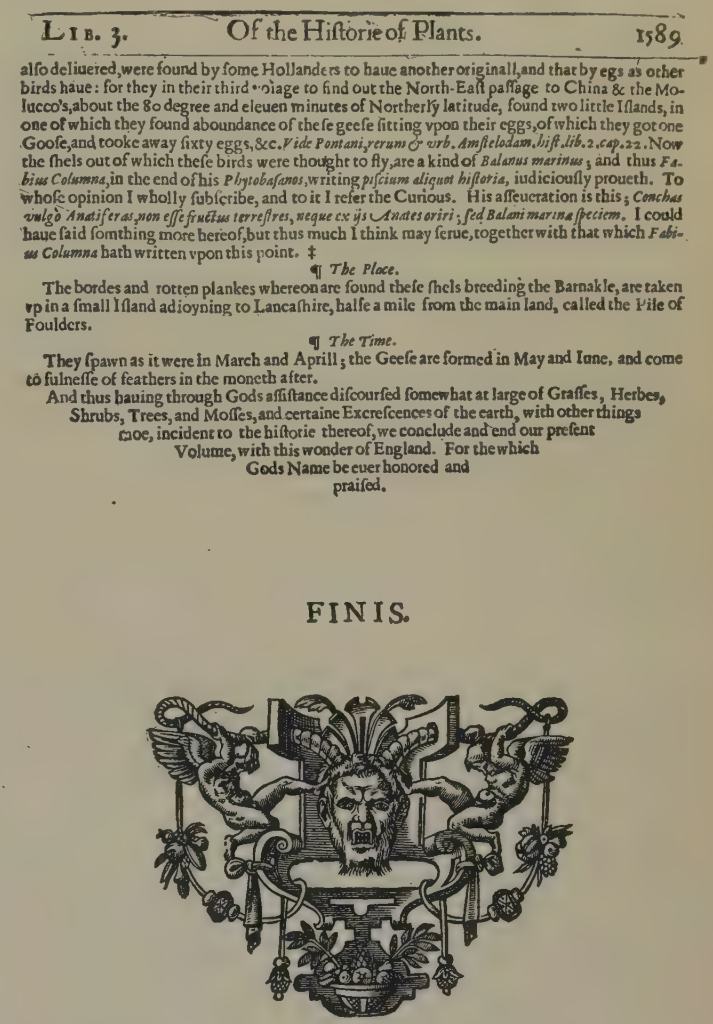
"There are found in the North parts of Scotland and the Islands adiacent, called Orchades, certaine trees whereon do grow certaine shells of a white colour tending to russet wherein are contained little living creatures: which shells in time of maturity doe open, and out of them grow those little living things, which falling into the water do become fowles, which we call Barnacles; in the North of England brant Geese; and in Lancashire, tree Geese: but the other that do fall upon the land perish and come to nothing: Thus much by the writings of others, and also from the mouths of people of those parts which may very well accord with the truth.

"But what our eies have seene and hands have touched we shall declare. There is a small Island in Lancashire called the Pile of Foulders, wherein are found the broken pieces of old and buried ships, some whereof have beene cast up there likewise; whereon is found a certaine spume or froth that in time breedeth unto certaine shells, in shape like those of the Muskle, but sharper pointed and of a whitish colour; wherein is contained a thing in forme like a lace of silke finely woven as it were together, of a whitish colour, one end whereof is fastened unto the inside of the shell even as the fish of Oisters and Muskles are: the other end is made fast unto the belly of rude masse or lumpe, which in time commeth to the shape and forme of a Bird: when it is perfectly formed the shell gapeth open and the first thing that appeareth is the foresaid lace or String: next come the legs of the bird hanging out, and as it groweth greater it openeth the shell by degrees, til at length it is all come forth and hangeth onely by the bill: in short space after it commeth to full maturitie, and falleth into the sea, where it gathereth feathers, and groweth to a fowle bigger than a Mallard, and lesser than a Goose having blacke legs and bill or beake, and feathers blacke and white, spotted in such manner as our Magpie; called in some places a Pie-Annet, which the people of Lancashire call by no other name than

a tree goose: which place aforesaid, and all those parts adjoyning do so much abound therewith, that one of the best is bought for three pence. For the truth hereof, if any doubt, may it please them to repair unto me, and I shall satisfie them by the testimonie of good witnesses.

"More over it should seeme that there is another sort hereof; the History of which is true, and of mine own knowledge: for travelling upon the shore of our English coast, betweene Dover and Rumney I found the trunke of an old rotten tree, which (with some helpe I procured by Fishermens wives that were there attending their husbands returne from the sea) we drew out of the water upon dry-land: upon this rotten tree I found growing many thousands of long crimson bladders, in shape like unto puddings newly filled, before they be sodden, which were very clear and shining; at the nether end whereof did grow a shell fish, fashioned somewhat like a small Muskle, but much whiter, resembling a shell fish that groweth upon the rockes about Garnsey and Garsey, called a Lympit: many of these sheils I brought with me to London, which after I had opened them I found in them living things things without forme or shape; in others which were neerer come to ripenesse I found living things that were naked in shape like a Bird: in others the Birds covered with soft downe, the shell half open, and the bird ready to fall out, which no doubt were the Fowles called Barnacles. I dare not absolutely avouch every circumstance of the first part of this history, concerning the tree that beareth those buds aforesaid, but will leave it for further consideration; howbeit, that which I have seen with my eies, and handled with my hands, I dare confidently avouch, and boldly put down for verity. Now if any will object that this tree which I saw might be one of those before mentioned, which either by the waves of the sea or some violent wind had beene overturned as many other trees are; or that any trees falling into those seas about the Orchades, will of themselves beare the like Fowles by reason of those seas and waters, these being so probable conjectures, and likely to be true, I may not without prejudice gaine say, or endeavor to confute."

The story of "The Barnakles Whole Fabulous Breed" my author here sets down, as have divers others, does not end at this junction. The continuation and finis of this story is to be found below. The subject matter, its italicized references and quaint printing, make it worth while to continue.



LIB. 3. Of the Historie of Plants. 1589

also deliuered, were found by some Hollanders to haue another originall, and that by egs as other birds haue: for they in their third voiage to find out the North-East passage to China & the Molucco's, about the 80 degree and eleuen minutes of Northerly latitude, found two little Islands, in one of which they found aboundance of these geese sitting vpon their eggs, of which they got one Goose, and tooke away sixty eggs, &c. *Vide Pontani rerum & vrb. Amstelodam. hist. lib. 2. cap. 22.* Now the shels out of which these birds were thought to fly, are a kind of *Balanus marinus*; and thus *Fabius Columna*, in the end of his *Phytobasanos*, writing *piscium aliquot historia*, iudiciously proueth. To whose opinion I wholly subscribe, and to it I refer the Curious. His asseueration is this; *Conchas vulgò Anatiferas, non esse fœtus terrestres, neque ex ijs Anates oriri; sed Balani marina speciem.* I could haue said somthing more hereof, but thus much I think may serue, together with that which *Fabius Columna* hath written vpon this point. ‡

¶ *The Place.*

The bordes and rotten plankes whereon are found these shels breeding the Barnakle, are taken vp in a small Island adioyning to Lancashire, halfe a mile from the main land, called the Pile of Foulders.

¶ *The Time.*

They spawn as it were in March and Aprill; the Geese are formed in May and Iune, and come to fulnesse of feathers in the moneth after.

And thus hauing through Gods assistance discoursed somewhat at large of Grasses, Herbes, Shrubs, Trees, and Mosses, and certaine Excrescences of the earth, with other things moe, incident to the historie thereof, we conclude and end our present Volume, with this wonder of England. For the which Gods Name be euer honored and praised.

FINIS.

Sfffff

Guardian of the King's Treasure

THIS reminds one of the White Cobra of Kipling's tale, whose once dark color had faded to ivory white through his age-long life in the lightless vaults where he had been placed as guardian of the King's treasure. This he had defended so well that, while the city above him crumbled and was forgotten, the golden riches lay undisturbed, for those who found them never returned home.

PHOTO BY INTERNATIONAL

THE WHITE COBRA

This snake is accountable for the majority of the deaths from snake-bite in India.

The cobra of real life, however, which is found over nearly all of India, and is responsible for a large proportion of the thousands of deaths resulting from snake bite, though usually of a brown color, sometimes takes on other hues, and is occasionally albinistic.

The abundance of the cobra, and its consequent death-dealing eminence, is largely due to the superstitious reverence in which it is held by the people. Formerly, at least, it was common for a family which had lost a member from its bite to capture the offending reptile, and, carefully protecting it from injury, liberate it as some distant point. Such customs doubtless went far, in former times, to keep the population from increasing beyond the numbers which could subsist on the natural resources of the country, albeit a drastic remedy for the miseries of famine. E. A. P.

AN APPEAL FROM AFAR IS ANSWERED

IN FAR-OFF Zululand a man was fighting almost single-handed to protect the wild life of this British possession in South Africa. Faced with government inertia, public indifference and many rebuffs, his heart was often heavy. One day he sat down and wrote to the American Nature Association, which he knew through NATURE MAGAZINE, pouring out his troubles. There was a wistful hope that somehow the members of the Association might help. They did.

In the May issue of NATURE MAGAZINE a short item was published under the title of "An Appeal from Afar." It told of the fight of F. Vaughn Kirby, Game Warden at Nongoma, Zululand, South Africa, against wanton butchery of wild life. The item said that a word of encouragement, a helping hand, would be welcome. Springing to the opportunity, members of the Association wrote to this beleaguered lover of the wild. The newspapers of the United States carried the word from the Association, and hundreds of clippings were forwarded to Major Kirby.

The fight went on. The warden was in the thick of it. During the hunting season he and his associates enforced the laws to their best ability. Came a visit of His Excellency, the Governor General, and Her Royal Highness, the Princess Alice. Major Kirby showed them the letters and clippings from America. The Governor General pledged himself to aid. The Minister of Lands made a similar promise. Now a lull has come, and Major Kirby feels that the danger of demand for wholesale slaughter has been averted. The friendly words of encouragement, the clippings, he writes, will serve further uses of education—a helping hand of one group of Nature lovers to another across the seas.

But there is one thing that bothers Major Kirby. He has not had time, in the ruck of the battle and his work, to answer those kindly letters. He appeals again to the Association, this time to voice his thanks until time can permit him to reply personally. We print his letter not alone because it tells what the members of the American Nature Association have done and can do, even unto Zululand, but for the very fineness of the letter itself.

Major Kirby addresses his letter to his unknown friends and sympathizers, saying:

"Unknown to me personally though you are, I yet feel that, so far as concerns everything that *really matters*, you *are* my friends. Your friendly, helpful and sympathetic letters bear witness to the fact. That common ground upon which we stand together as friends is that of our mutual love of the beautiful, helpless creatures of the wild, our love for Nature and her beauties.

"I would like, if I may, to record the names of those who found time, amidst the pressing business of school, or of adult life, to send their messages of sympathy to far-off Zululand—messages which have brought encouragement, not alone to me, but to my many friends in this country.

"I ask, then, that each and all of the following will accept my grateful thanks: Mr. Winthrop Packard, of the Massachusetts Audubon Society; Mr. George F. Veith, of Norfolk County, Virginia; Mr. Atchison Fraser, of Kentucky; Mr. P. R. Marsh, of Illinois; Mr. and Mrs. Sales, of Colorado; Mr. P. L. Burton, of Buffalo, N. Y. (I *would* like to get a grip of your hand, Sir.); Mr. S. F. Rathbun, of Seattle, Washington; Mr. Carlton G. Murray, of Michigan; Miss Myfannwy Andrews, of Los Angeles, California; Master R. E. Brubaker, of Pennsylvania; Master Ben Fawcett, of Ohio; Master Sam P. Eastman, of San Francisco, California; Master Merril Wood, of Harrisburg, Pennsylvania.

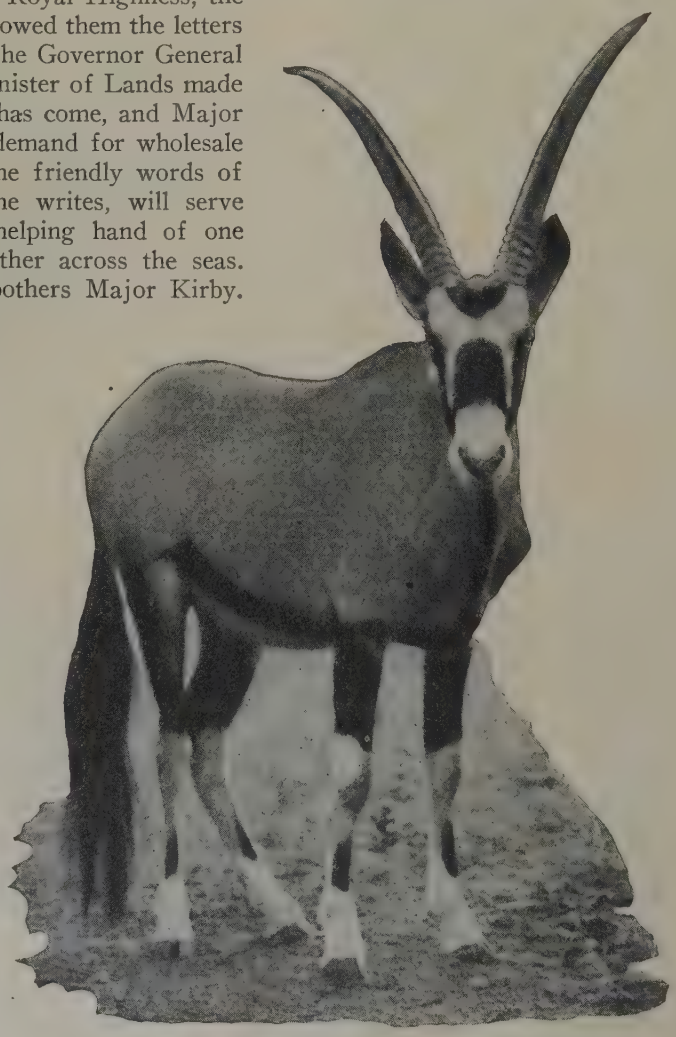
"I am profoundly touched by these letters from you young people—from a young girl, and from lads of between 13 and 16 years of age! They are a revelation, and indicative of the magnificent spirit of their country, and of the attitude she takes up towards the helpless creatures of the wilds.

"And they make it clear that the safety and well-being of these children of Nature may be considered assured, when the young people of the country, the rising generation, can feel and write so sympathetically about them.

"And if, as I feel sure is the case, the American Nature Association and its mouthpiece, the NATURE MAGAZINE, have been the main source from which you young people have drawn your inspiration, then indeed they are worthy of the support of all Nature lovers.

"I will try and write to each of my correspondents individually, young and grown-up, as soon as I can make time, but in the meantime I would like to say a word right here—you have taken up a study which will assuredly be a source of endless pleasure and profound interest to you throughout your lives. Never chuck it, boys and girls, because it is one of the *'worth-whiles.'*

"Nature is a loving teacher, though a jealous one; those who approach her with sympathetic understanding, and minds set upon knowing her, will quickly come to love her,



PHOTOGRAPH INTERNATIONAL

"THANK YOU, AMERICA"

This is the Gemsbok, a South African antelope, and one of the animals that is threatened by the wholesale killing.

and to those she will reveal her hidden secrets and give of her treasures with a free hand. Her furred and feathered messengers will speak to you with no uncertain voices; her trees and shrubs, her mountains and valleys, her rivers and streams, will all have a loving message for you, and soon her every mood will make an appeal to you.

"But she is a jealous teacher, too, and will reveal nothing to the merely *casual,* or to those whose hearts and minds do not respond to the appeal of her beauty and of her wonders. The great book of Nature ever appears to her untaught children beautiful—its cover, its exterior, ever charms the eye, but its hidden beauties they know not—a bird is a bird, an acorn an acorn, a volcano is a volcano, but why and how these things exist, what part each plays in the great drama of Nature, how *can* they know it? But those who seek knowledge, who desire a further insight into her mysteries, she is ever ready to assist; the very charm of her outward beauty courts admiration first, then invites inquiry.

"And at every stage of inquiry, we learn and love more, for the Unknown has become the Known, and the Dark, Light.

"Before I close let me just say a word as to the situation here in connection with our wild game. It is satisfactory to be able to tell you that it is no *worse,* and perhaps might be described as being a trifle easier; at all events the loud-voiced outcry for destruction has diminished to a *squeak!*

"The victory is not yet won, *very far* from it, but there are some who are beginning to think. I have at times almost despaired, the struggle seemed so hopeless, so profitless, in the face of the crass ignorance of our opponents, and their lust for slaughter.

"But when I read your letters, I said to myself 'Hang it all, these were not written by "hands uppers," but by those who would fight to the last ditch,' and surely I can do the same, knowing that such brave and sympathetic spirits in far-off America are backing me!

"So that while I feel that I cannot sufficiently thank you all, I can at least give gou this assurance, that you are *not backing a quitter.*"

Setting the Captives Free

By Howard Taylor Middleton

DID YOU ever stand, as I have, before a gloomy cage in which two glorious bald eagles pined their heart-broken lives away longing for a cloud-wrapped mountain home, and wish that you might grant them liberty—the very thing they stand for, but never again will know?

While you cannot throw wide the prison doors in reality, you can easily accomplish it photographically. Simply take a picture of the captives, with your camera lens between the foreground bars, so they will not show in the picture as black vertical lines across the bodies of the subjects, and when you have developed and fixed the film, with a fine camel's hair brush dipped in opaque water color, block out the prison background. Then select from your cloud negatives one that suggests the mists that unfold an eagle's aerie, and double-print—thus setting the captives free.

It is much easier to print in clouds, from another negative, when enlarging than when making a contact print for the reason that in the former case the paper on which the enlargement is made is on a table, or on an easel, out in the open, where the operator has free access to it. He can, therefore, see exactly what he is doing.

CAPTIVES NO LONGER

A bit of opaque color, a second cloud negative, and double printing, free these bald eagles from their cage in a city zoo—photographically speaking.

In printing clouds in a picture by contact, the operator cannot see what he is doing, and the result is what one would expect from mere guesswork manipulation.

When the negative of the landscape picture, in which clouds are desired, has been projected upon the easel, it is possible to mark the sky line by placing pencil marks on the margin of the printing paper and then print the foreground and the object of interest while the sky part of the negative is being shaded by a piece of opaque paper that the operator holds a few inches *above* the paper and keeps in constant movement during the printing.

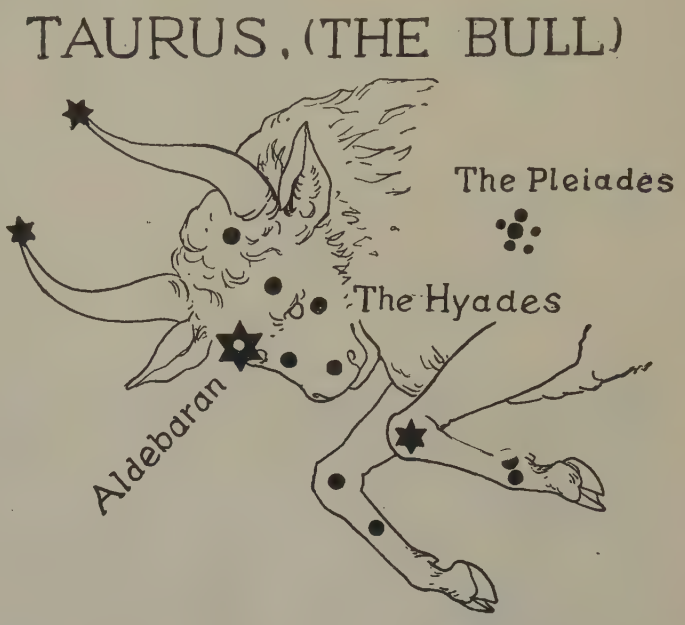
After the principal object of the foreground is printed, the negative is removed from the enlarging camera and the cloud negative put in its place. In printing from the cloud negative, all that part of the print which was exposed the first time is shaded.

STORY OF TAURUS AND THE JANUARY SKIES

By Isabel M. Lewis

AMONG the most ancient of all the constellations is Taurus, The Bull, which you will easily find in the early evening hours of January, on or near the meridian south of the zenith. Its brilliant Aldebaran, and two famous groups, The Hyades and The Pleiades, should be known to all star-gazers.

Taurus is one of the groups of the Zodiac and the sun passes through it in its apparent annual circuit of the heavens. From about 4000 B. C. to 1700 B. C. the sun was in Taurus at the beginning of spring. Its stars were made much of by the early Egyptians for this reason, and also because it was their belief that the human race was created when the sun was in Taurus.



Among the Greeks there was a mythical story that Taurus was the beautiful, snow-white bull whose form the god Zeus assumed in order to capture Europa, daughter of Agenor. As the maiden was playing in the meadows with her companions near the shore of her native land, Phoenicia, she leaped in play upon the back of the bull who dashed into the sea with her and bore her away to the island of Crete. Only the head, shoulders and forelegs of Taurus are pictured in the star maps because the remainder of his body is supposed to be immersed in the waves. According to another story Taurus is the bull that is charging down upon the warrior, Orion, who stands facing him with club uplifted to repel attack.

The forehead of Taurus is outlined by the group of the Hyades in the form of a Roman V, and Aldebaran marks the fiery red eye of Taurus. The Greeks, it seems, were not the only people who saw in this group of the Hyades the features of a bull, for the Amazon Indians have pictured the same group as the head of a bull. Other natives of South America called this same group the Jaw of an Ox.

The Hyades and Pleiades were often called The Atlantides because they were half-sisters and were all daughters of Atlas. No two groups of stars have been more celebrated in stories and legends of all lands, civilized and barbaric, than the Hyades and the Pleiades. Modern poets and writers often sing of their beauty and their charm. The Pleiades have been beautifully compared by Tennyson to "fireflies tangled in a silver braid" and by Bayard Taylor to a cluster of golden bees upon the mane of Taurus.

Among the Greeks and Romans there was the belief that the rising or setting of a group of stars with the sun, the heliacal rising or setting as it was called, exerted some peculiar influence over the affairs of men. As the Pleiades rose with the sun about the time of the opening of navigation in May, they were the sailing stars for the Greeks, just as the Hyades were the rain stars because they set just after the sun in the showery spring-time and just before sunrise in the stormy season of late fall. Today, though freed of such superstitions regarding the influence of the stars over the affairs of men, we find that the ancient myths and stories about these and other groups of stars give an added interest to their study as they return to us year by year in season just as they did to the ancients so many centuries ago.

For nearly two years the readers of Nature Magazine *have found the articles by Isabel Martin Lewis an open sesame to the evening heavens. Commencing with this issue, Mrs. Lewis will take up a constellation each month, selecting one visible in the evening skies. She will tell the legendary tales that are woven around these heavenly bodies and place the various component parts for the lay astronomer. The survey of the evening skies as a whole will also be continued.*

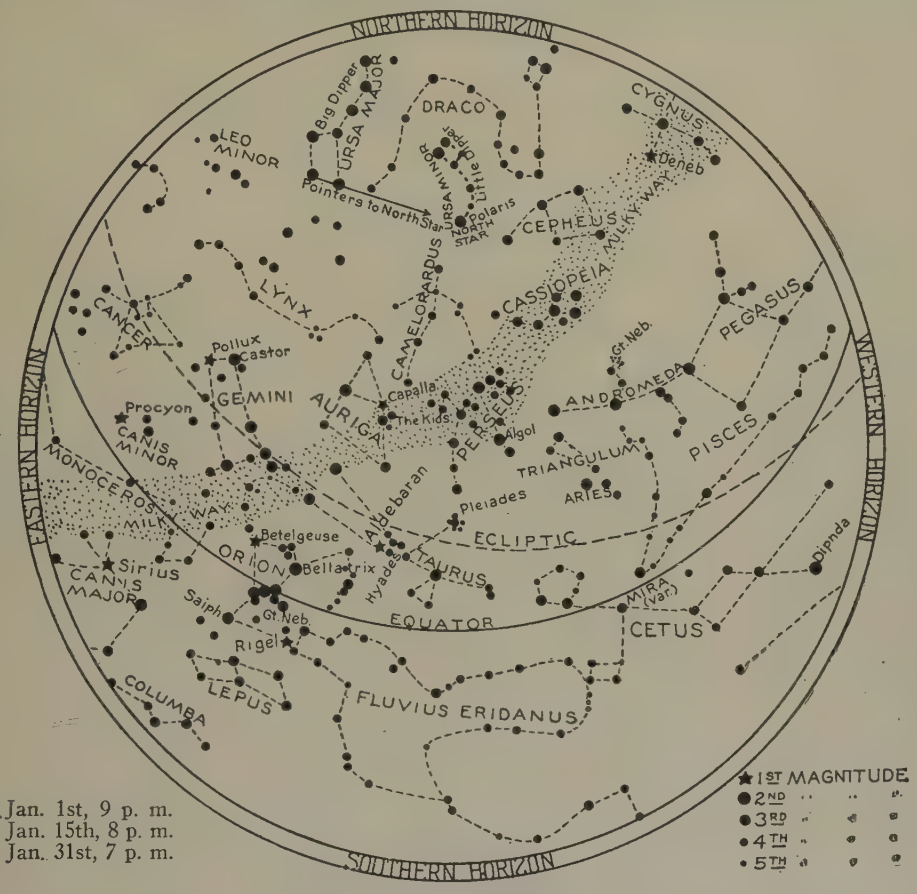
From Taurus let us now turn to the whole panorama of the January heavens. Of special interest this month is the total eclipse of the sun in far-away Sumatra on January 14. We will recall the great interest that was aroused in the northeastern states a year ago by the occurrence of a total eclipse of the sun on January 24, 1925, which was successfully observed by several million people. Now some of the astronomers who observed this past eclipse, in Connecticut or in the airship *Los Angeles* off Montauk Point, are on the other side of the world in Sumatra. There they are setting up and adjusting their instruments in the hope of continuing their observations of the solar corona and other phenomena that can be seen only at these few brief moments when the moon totally eclipses the sun.

At least two expeditions from the United States will attempt to make observations of this eclipse. One of these is from the United States Naval Observatory and includes Professors Peters and Littell, who observed the eclipse of last January from the *Los Angeles*. The other expedition is from the Sproul Observatory of Swarthmore College, and also includes seasoned eclipse observers who have observed total solar eclipses in other lands as well as in this country a year ago.

The path of the coming eclipse passes about three hun-

dred miles south of the path of 1901. The town of Benkoelen, near which it is expected that most of the scientific observers will be located, lies in the middle of the path. The duration of the total eclipse at Benkoelen will be a little over three minutes. There the eclipse will occur at 2:25 P. M. with the sun high in the heavens.

It is also expected that one or more expeditions from European observatories may observe this eclipse on or near the coast of eastern Africa in equatorial regions where totality takes place early in the morning. After leaving the coast of Africa the path of totality crosses the Indian Ocean to Sumatra, Borneo and the island of Mindanao in the Philippines where the eclipse occurs late in the afternoon. A large partial eclipse of the sun will be visible in eastern equatorial Africa, the Malay Peninsula, the East Indies and the Philippines. This is the first total eclipse of the sun to occur since the eclipse of January 24, 1925. The results in Sumatra are being awaited by astronomers of all lands with great interest.



Jan. 1st, 9 p. m.
Jan. 15th, 8 p. m.
Jan. 31st, 7 p. m.

To use hold over the head with top toward the North

The planet Venus is now a magnificent object in the western sky after sunset. It sets more than two hours after the sun early in January and attains its greatest brilliancy on January 2, thirty-six days before its inferior conjunction with the sun. Before the month is over Venus will be too close to the sun to be seen, and stargazers will not see this beautiful planet in the evening sky again for many months to come. The planet will again reach its greatest brilliancy, as a morning star, in March. At the time of greatest brilliancy Venus shows the crescent phase in the telescope resembling the moon when it is five days old. It then casts a strong shadow and may be seen with the naked eye in broad daylight.

The planet Jupiter which has also been visible in the western sky after sunset for some time is now getting too close to the sun to be seen. It will come into conjunction with the sun on the 25th of the month after which it will pass to the eastern morning sky.

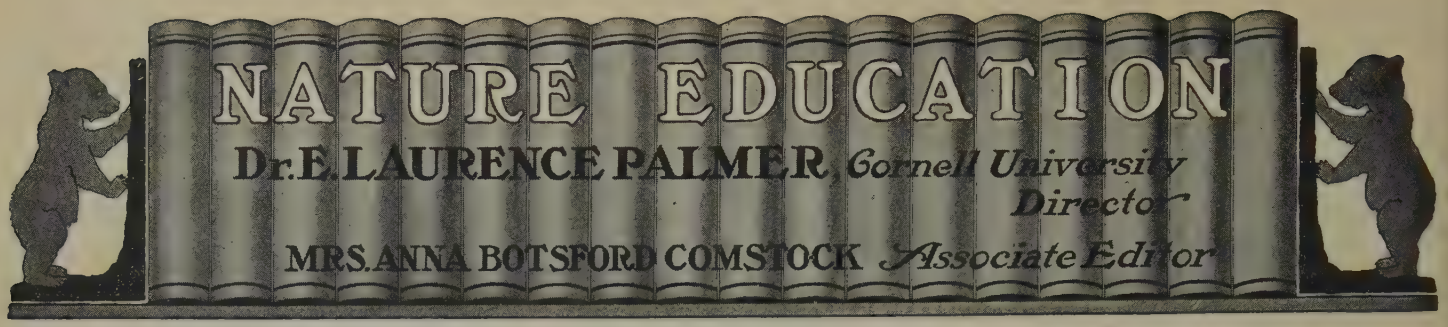
Mars and Saturn may now be seen in the eastern sky before sunrise. Saturn will be in Libra throughout the month. At the beginning of the month Mars will be found in Scorpio a few degrees to the northwest of Antares and a little to the southeast of Saturn. Mars will pass rapidly eastward through Scorpio during the month, however, and by the end of January will be far to the east of Saturn. Before the year is over Mars will once more be an object of great interest to all for it is again approaching the earth and another close opposition when it will be about forty million miles away.

January is one of the best months of the year to renew our acquaintance with the glorious constellation of Orion, which is visible from all corners of the earth and is considered to be the finest of all the constellations. Neither should we overlook the Dog-stars, Sirius and Procyon, following close at Orion's heels, Taurus, threatening him on the west, or Auriga, The Charioteer, or Gemini, The Twins, to the north and northeast of Orion. Perseus we now find almost directly on the meridian to the north of the zenith.

The Milky Way is also visible on clear, dark nights as a beautiful band of milky light, a blend of the rays of countless faint stars, too distant to be visible to the naked eye. It extends from the eastern horizon past the feet of Gemini, through Auriga, Perseus, Cassiopeia and Cepheus to the Northern Cross in Cygnus, now disappearing in the northwest. The Big Dipper has now passed the unfavorable position that it occupied in late fall evenings close to the northern horizon and is swinging upward in the northeastern heavens with The Pointers to the North Star now well in view, so get out your telescopes and your star maps and take advantage of the crisp January evenings.

AMATEUR PHOTOGRAPHERS

On page 52 of this issue of NATURE MAGAZINE *will be found the nine winning photographs in the January contest. The entrants in the February contest have already sent in some fine material. The pictures are getting better. So long as interest warrants, we will continue this meeting place for Nature photographers. Photographs for the March contest should be in by January 15. A prize of a year's membership for the winning photograph. Address: Photograph Editor,* NATURE MAGAZINE, *1214 Sixteenth St., Washington, D. C.*



Some Advantages of Nature Education

By E. L. Palmer

THE response of the readers of this Nature Education Section has not been voluminous, but it has been intensely interesting. The first fifteen questionnaires returned from the October number represented fifteen different states and every type of observer imaginable. The article dealing with Nature Education as a profession brought responses from such varied individuals as a mature woman who wished to go into Nature work with women's clubs to a boy who wished to go to the North Pole. Superintendents have written to find out what we are "driving at" in Nature work, anyway, and school teachers have written asking how we may attain what we seek.

Obviously it is difficult to make this section satisfy everyone every month. This month, I propose to present some of the educational opportunities offered by Nature Education not so obvious in the more formal subjects.

THE OPPORTUNITY OF LEARNING TO READ CRITICALLY

This article is being written on Election Day. Last night the papers were full of the platforms of various candidates for office. Two papers which I read offered entirely opposite viewpoints on the merits of certain amendments calling for expenditures of state funds. The passage of one of these amendments might help me by giving me more pleasant quarters in which to work. At the same time it will affect the amount of taxes which I will have to pay. I was compelled by circumstances to read the contentions of the two sides critically. I am not sure that my decision was for the best, but I am sure that I had little opportunity while taking reading in the elementary schools to read critically. In those days I merely read the words and I am quite certain that sometimes we all still do that to some extent. Could Nature Education in the grades have given me any preparation for reading critically the material which I read last night? Certainly the reading which I did in the grades did not lead to the habit of reading critically. As a matter of fact it led to habits of a most uncritical nature. My experience in high school and normal school did little to upset these uncritical habits. Rather, my high school and normal experience developed the habit of taking notes more rapidly, a practice which certainly does not develop a critical nature. How can Nature Education help in this situation if we grant that a critical attitude is desirable?

A certain third grade nature reader states that "When the earthworm goes into its hole, it always pulls a small leaf over the opening." This reader is adopted as the state text in a number of states. The same series states that the skunk spreads its scent by squeezing some of the ill-smelling liquid on to its tail and then shaking it off as one shakes water off a broom. At first thought one is prone to condemn these readers for their scientific inaccuracy. One does so definitely when he finds that they advertise their scientific accuracy. But from the standpoint of reading they have certain advantages. The fact that their subject matter concerns earthworms and skunks with which the average child can have experience offers certain advantages. If a child has seen the thousands of uncovered earthworm burrows which abound on lawns, he should, if he is reading critically, rebel at the statement quoted. The reader should, of course, provide the teacher at least with the facts of the case. If the school could have provided the whole reading class with opportunity of studying earthworms before the reading lesson and the class then read and accepted the quoted statement, there was obviously something wrong somewhere. Nature work is in a position to offer this opportunity. Other fields of thought cannot always do it so readily. A child may read that "George Washington was the first President of the United States" but he cannot demonstrate the truth or error of the statement.

It is true that with the advantage offered there are disadvantages. If the child reads about George Washington, the teacher is probably the court of appeals in case of a questioned error. If the child reads about the earthworm, the worm itself is final judge in the matter. Some, and in fact many, teachers do not enjoy sharing their authority with worms, frogs, skunks and the like. This jealousy on their part may to some extent account for the lack of enthusiasm for Nature work which many teachers show. Many of these teachers are unquestionably splendid teachers in a system which calls for a certain type of development on the part of their pupils. I question, however, whether their pupils in reading learn to read critically. Pupils and parrots can say words that sound almost exactly alike. The child, however, has the opportunity to understand what the words mean. Can't Nature Education help him make the most of this opportunity?

Let me add incidentally that I would not recommend that teachers announce to their reading classes that a certain Nature reading lesson contains a certain number of mistakes and that the children are to attempt to find them. This has the disadvantage of the unnatural setting of formal examinations and of certain commonly used tests. If the facts can be found without using the tests, why use the tests? There are people who think that if education is to prepare us for life it must be sown with unpleasant difficulties. They forget that there are many successful people who actually enjoy working for a living.

THE OPPORTUNITY OF FORMING CONCLUSIONS FROM ORIGINAL DATA

Closely related to the habit of reading critically may be the habit of collecting original data and forming con-

clusions from them. Most of us are prone to "Let George Do It" even to the extent of letting him exercise his senses for ours. I recently stood before a spicebush with a group of college students. As you know, spicebush has bright red fruits. It has leaves whose margins are entire. Its twigs are smooth to the touch, and its bark has a distinctly spicy taste. The students were taking notes, as had been their habit from time immemorial, so I told them that the twigs of spicebush were rough, that the margins of the leaves were deeply cut, that the bark was very sour to the taste, and that the fruits were bright blue. Although the plant before them bore bright red fruits, many of the students wrote everything I had told them into their notes as I had told them. Of course, I had to excuse the students to some extent because so frequently they have an enormous amount of detailed information rammed into them by the lecture method that they have to trust their instructors now and then. They could, however, have seen that the leaves, twigs and fruits did not check up with my remarks and should, as was the case with a considerable number of them, have refused to believe me. Had I been talking to them about the history of Nature Study they would have had to take much for granted. They would not have had the opportunity offered by the spicebush before us. Their word as to the color of the fruits should have been as good as mine. Such would not have been the case with the history.

This independence of thought, which may be lacking in college students now and then, is frequently very well developed in elementary school children. A letter which I recently received from a rural schoolgirl says, "Our teacher said that snakes don't bite and I don't believe her and I would like to know if that is so." While one admires the child's independence of thought so far as the teacher is concerned in this case, he does not admire the child's looking for authority to any other place except the snake. Too many people "look to authority for proof instead of to proof for authority." Sometimes this habit of appeal to what is supposed to be authority is carried to amusing ends. For example, a rural teacher who lives in the open dairying country once wrote to ask me which end a cow got up with first. Had she seen a cow get up in a manner contrary to my statement she would no doubt have taken the cow to task in the matter. Another wrote, "This fall we collected some cocoons which we hoped to keep over winter. We thought that they wouldn't hatch until spring. Some of them hatched this fall. Were we right?" Are not there too many of us unwilling to admit that we are wrong no matter how reliable the evidence. Nature work offers a splendid opportunity for upsetting preconceived notions. No matter how hard we try we cannot make a horsehair turn into a "horsehair snake." No one has ever seen a dragon fly sew up a person's nose. The schools are full of youngsters who believe these impossibilities are possible. Why neglect the opportunity of letting them disapprove them through the exercise of their own senses? If a teacher says, "Edgar Allan Poe wrote the Constitution of the United States" the child cannot offer his own experience as a counter-authority.

While a child's experience may be so limited that he cannot always draw safe, broad generalizations, there is little reason why he cannot come to satisfactory limited conclusions from the limited opportunities offering themselves to him. Nature Education should make these opportunities less limited.

So much of the source of information and inspiration which children normally get in elementary and secondary schools lies in books that it is unfortunate that more opportunity for independent thought and interpretation is not given. Books are nothing but the results of interpretations of others. Often to get back to the original observation we might have to go through books and books and books. Anyone who has played the game "gossip" knows how much chance for error there is, and anyone who has written for publication knows of the dangers of typographic error which persist under the most careful supervision. "With all their faults we will" still love books, however. The opportunity which they offer for broadening experience in a way compensates for the danger of error which they present. They should, however, be coupled with opportunity for original exercise of the senses. Nature Education offers this opportunity.

THE OPPORTUNITY TO PRESERVE THE EXPRESSIVE NATURE OF CHILDREN

One of the differences of speaking publicly to large bodies of children and to large bodies of adults is this. In speaking to children the speaker has to devote a considerable effort to keep his audience from expressing themselves. In speaking to adults, particularly to teachers, he has to spend more effort to get them to express themselves. There are, of course, exceptions to this rule. An interesting narrative may still and hold both adults and children. But for real honest to goodness response, the children win the award. This response must be desirable if we can judge of the frequency with which public speakers end their talks with, "Are there any questions?"

One of the tasks of the teacher of Nature work is to direct the children's activities along profitable lines; to be sure that the children's observations are sufficiently accurate for the purposes intended. Any experienced teacher knows that the birds, flowers and mammals reported as having been seen by children do not always exist in Nature. A bird calendar that reports a child's having seen a sandpiper perched on a telephone wire in January in New York State probably has at least one inaccurate observer as a contributor.

While I am not convinced that the method is ideal, I am beginning with this number a series of teacher helps which have been very popular with New York State's teachers. These helps are designed to offer some guidance for observation of pupils and give them the opportunity of expressing themselves profitably.

Fifteen Interesting Things to Look for in January

WHEN I first started writing these lists of interesting things for which children might look I presented an Iowa school with a list of things which might be seen between February and June. When I returned to the school in a few weeks the children had reported seeing everything even to yellow warblers in Fort Dodge, Iowa, in February. It was evident from the results that something should be done to safeguard against unjustified reports.

As a result of experience I believe it will be best, if teachers prepare their own lists, that they follow this procedure. First, describe sufficiently the thing to be seen; second, name it; and third and most important, ask for some additional observation which cannot be found in books or pictures. This additional observation should be of sufficient significance to assure you that the observation was actually made. It should also be so stated that it cannot be answered by choosing between two alternatives. Where possible, the first description given should be made in terms such as the child himself uses. To this end I have frequently taken children on trips and when we saw some bird or plant asked them to tell me what they saw. Many saw things

entirely different from what I should have expected. It might be mentioned that the interesting things which appear in this section will be chosen from questions which have been asked the writer in correspondence with children or directly by the children themselves. The fact that children have asked about them should be some index that the things mentioned are interesting.

WOODY PLANTS

1. During January the twigs of some silver maples bear buds of different sizes and different shapes. This difference may be due to the fact that the flower-buds and leaf-buds vary considerably. Break off a few twigs and put them in water in the house and answer these questions, if you cannot answer them from the twigs themselves out of doors. Are the flower buds at the very tip of the twigs or do the buds at the tips of the slenderer twigs produce leaves? How do the flower-buds differ from the leaf-buds in shape and in size?

2. During January many of the birches shed their fruits from cone-like structures. These tiny fruits may be found sprinkled out over the snow and crust. Open one of the cone-like structures on a birch and decide whether the tiny fruits are juicy enough to be food for birds, whether they have any devices to help the wind carry them, or whether they are sticky or dry.

3. Heavy snows often weigh down the branches of trees in January. How do maples and pines or spruces compare in their ability to avoid danger from heavy snows? Look at a picture of evergreen trees which grow near mountain tops and see if they are in any way better fitted to withstand the weight of snows than are the evergreens of lowlands.

WEEDS

4. The weeds whose tops stick above the snow in winter serve a number of uses. They help their own kind and they help the birds who feed upon their fruits and seeds. Among the common weed tops are those of pigweed and of milkweed. Which of these is the more valuable in supplying a lunch to birds? The milkweed seeds differ very much from those of pigweed. Which of these words would apply to milkweed seeds and which to pigweed fruits—flat, black, brown, shining, dull?

5. Many weed-tops write records on the snow showing which way the wind blew. Make a list, if possible, of the weeds that you find doing this.

BIRDS

6. Among the birds to be found feeding on the seeds of various weeds are little gray birds which show white outer tail feathers when they fly. These are probably juncos. Do they walk, run, skip or hop over the snow or do they seem to make a combination of these methods of locomotion? Are their bills lighter, darker or the same color as the feathers of the head?

7. Among the other birds found feeding on weeds are little fellows that seem to have little ear-tufts of feathers. Their faces seem to be of black and white. These may be horned larks. When they go over the snow do they walk, run or hop? Do you generally find them singly, in pairs, or in flocks? Examine their tracks and see if you can tell whether their hind toes are as long as or shorter than the front toes or whether they are longer than them.

8. In most parts of the country the snow may be well marked with the arrow-like tracks of pheasants. Do these arrows point in the direction in which the pheasants were walking or in the opposite direction? If you can't find pheasant tracks for this, look at the tracks of chickens or quail for the same purpose.

INSECTS

9. In the November NATURE MAGAZINE there appeared an article about snow-fleas. It described them so well that you ought to be able to recognize them if you find them. The article told you that they jumped in a peculiar manner but did not tell you whether or not they flew. Try to see if you can get them to move in any other way than by jumping or walking, and if you succeed tell about it and how it was done.

10. It may sound strange to go hunting insects in winter, but the bed of a brook may be well supplied with insect life on a day when the thermometer reads below zero. Among the insects you may find there are the black water-scavenger beetles and the black and brown diving beetles. These beetles carry their air supply under water in an entirely different manner. One carries it in a bubble at the rear and one carries it in a film over the under side of the back part of its body. Which is which?

EARTH AND WATER STUDY

11. While looking for water life in a brook in January you may notice that the ice crystals under the ice where the temperature has been fairly constant for a considerable length of time differ in size from the water crystals formed above the ice where the temperature may change more rapidly. Which is the larger?

12. Snow makes an excellent means of studying earth forms because we can see in it almost all of the land forms mentioned in our geography, and, best of all, we can see these various forms actually taking shape quickly. Deltas of slush form in the gutters more quickly than do deltas of mud at the mouths of rivers. The gutter deltas may be of fine material or of coarse ice and snow mixed. These masses may consolidate much as the earth masses have consolidated. Does there seem to be any system that you can describe that tells where you would expect the coarser materials to be laid down and where you would expect the finer material? If so, describe it.

GENERAL INVERTEBRATE LIFE

13. Under old logs even in winter you may find centipedes that have but one pair of legs to each body segment and millipedes with two pairs to each segment. Which of these animals can move the more rapidly? The members of one of these groups generally eat plant material, and of the other, animal material. Which do you suppose is which, and why?

MAMMALS

14. The snow may be covered with the tracks of rabbits such as cotton-tails. Their hind feet are, of course, larger than their front feet. Examine some of the tracks to see if you can tell which way the animal was going and then watch a cotton-tail make tracks and see if you were right. When a cotton-tail is speeding, do his front foot tracks appear ahead of or behind the tracks of his hind feet?

15. In some parts of the country raccoons may be active in January. They are, as you know, fairly large, brownish animals with black banded tails. They climb trees readily. Do they ever come down a tree head first like a squirrel? Do they hold their hind feet as a squirrel does in coming down a tree?

Serving as a signpost on the road to Nature Knowledge and Nature Study, "Things to Look For" will be a feature of the Nature Education Department. The naturalist, amateur or professional, must be a good reporter. But before the star reporter rises to this high station, he must start as a "cub." He must develop his "nose for news." The star naturalist must develop his "nose for Nature." This department will help.

Nature Study Review

Suggestions for the use in Nature Study of the articles in this issue of NATURE MAGAZINE

By ELIZABETH K. PEEPLES

Teacher in Charge of Nature Study, Washington, D. C., Schools

Feathered Guests of the Winter Snows Here are directions and suggestions for feeding winter birds woven into a story in which Nature classes will revel. It should be read to or by the pupils according to their age and ability. Ask the children to list the kinds of food which the author tells of having put out for his storm-stayed guests, the places in which he put it, and special devices for making food attractive to certain kinds of birds. They should then set about a systematic program of feeding the winter birds of the home and school neighborhood, listing their bird guests, and comparing experiences and observations with those described in the article. There will be in all this activity material for oral and written expression. To send the best compositions to the contributors' column of a local paper may give added interest to writing them.

* * *

Getting the Habitat Habit Making a habitat group will delight a class, and give them opportunity to use knowledge gained from Nature material in a way which requires not only facts but an appreciation of relationships and values. Fifth and sixth grade pupils will be able to work out simple groups from the directions given in the article, but should not undertake difficult problems. A simple group well done "is far better than a lot of badly executed detail." Older pupils may attempt more in accordance with their experience and aptitude for such work.

* * *

Some Cats of Ours If Nature Study is good for anything, it should be good for developing open-mindedness for truth. Encourage children to watch and report upon what cats are actually seen to do. Collect as much evidence as possible and weigh the good points against the bad, remembering that cats are active at night when their natural prey birds are helpless or nearly so. There is little need to worry about the encouragement cats will receive if actual facts are collected. Remember that scientifically and economically studied the cat is an entirely different creature from what it may be occasionally if studied sentimentally. We are forced to live by economical forces and by the laws of science, not by sentiment alone. As time goes on this will become increasingly so. When that time comes, if not before, the other side of the story here presented will probably form our rule of conduct towards cats. Let the article form a basis for discussions. These discussions should of course result in the forming of judgments which will not complicate the difficulties which we must face in the future.

* * *

Nature's Rosettes of Winter Green At the season when the diminishing supply of Christmas greens is in the foreground of attention for classes studying evergreens, it will prove interesting to bring to the observation of the pupils an abundant form of evergreen almost universally unnoticed. A trip to a vacant lot, pasture field, or old garden will establish the fact of the abundance of leafy bright green rosettes formed by many plants. From the pictures nine varieties of rosettes can be identified. It may be difficult to recognize other forms discovered, because of the difference of the rosette leaves from the more familiar ones of the upper part of the plant, but this fact should add zest to the study. Have each pupil start a record in sketches of observations, placing a small stake or marker beside the one or several rosettes upon which he will report. If rosettes of the same kind are sufficiently plentiful, he should dig one up to see the relation of the root and leaves, and to discover if possible the advantages gained from the peculiar arrangement of these evergreen leaves. As the upper part of the plant develops in the spring and the sketch record grows, he can name it with the help of a simple key. Encourage the child to continue his observations through the summer and fall to find out when the rosette is formed. If interest can be sustained long enough for him to learn for himself whether the plants studied are annuals or perennials, much will be gained not only in knowledge, but in perseverance, patience and belief in the worth of his own efforts. In correlation with art work the rosette forms offer unusually attractive motifs for design.

* * *

The Giant and the Elf While studying either the owls or woodpeckers of the locality, children of the fifth and sixth grades or Junior High School should not fail to read this story of the elf owls of the Arizona desert. Discuss the points of likeness and difference between the elf owl and other owls studied, especially the matters of migration and food habits. Investigate nearby woodpecker nests, (provided it is not nesting season,) to gain a more vivid idea of the difficulties overcome by a bird carpenter who hollows out a nest in the heart of a spongy cactus. Ask the children to report on the kinds of trees most often used by woodpeckers for nesting sites and whether the holes are made in living or dead portions. They should compare the work of the sapsucker witl. that of other woodpeckers, especially the gila. Observation of wounds in local trees healed by a growth of bark will help in understanding how the sahuaro forms the "hard-shelled, gourd-shaped house" used by the elf owl.

* * *

Forests of Chalcedony Among fifth or sixth grade children beginning the study of rocks and soils, some one is almost sure to add to the collection, which the class makes for the schoolroom, a bit of petrified wood brought home by a friend or relative from a never-to-be-forgotten trip. To be told that this cherished treasure is of the same substance as the bits of quartz contributed by almost every member of the class is a great surprise; but any disappointment will be removed by the story which the teacher should tell after carefully reading this article. Pupils should compare the specimen of petrified wood with a piece of wood to see the similarity of structure. They should study the illustrations and collect other pictures of the petrified forests, being sure to locate them on the map. Those living where Sequoias or Norfolk Island pines grow will find renewed interest in these trees because of their relationship to the trees of the petrified forests.

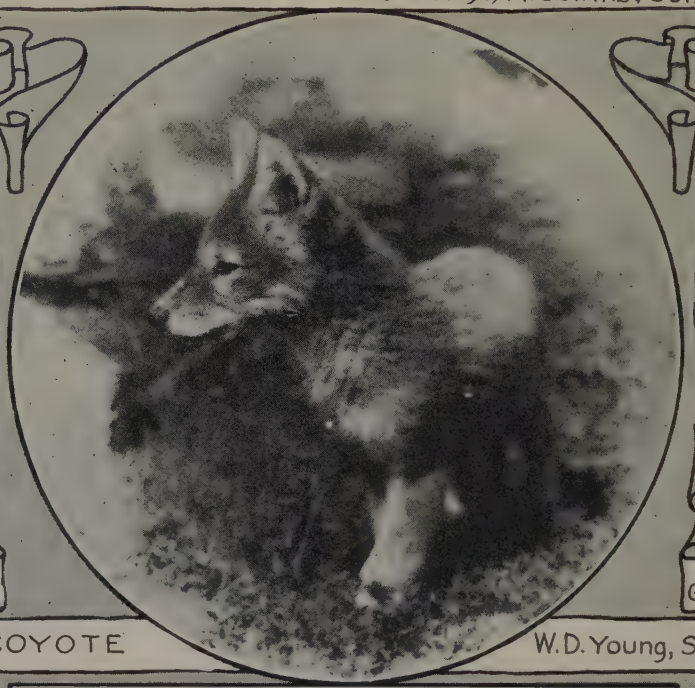
JANUARY WINNER

BABY HOUSE FINCHES Mabel A. Hoyt, Ft. Collins, Col.

WESTERN JAY
Gorton Linsley, Oakland, Cal.

EASTERN JAY
R. Ervien, Upper Darby, Pa.

FLICKER
Dorothy Wyckoff, Bryn Mawr, Pa.



BABY COYOTE W. D. Young, Seattle, Wash.

HOUSE WREN
Grace Coing, Cold Spring, N.Y.

INDIAN PIPES
Klaus Abegg, Perth Amboy, N.Y.

LOST IN THOUGHT George C. D. Fridrik, McGill, Nev.

AT LUNCH
Marion F. Smith, Lynn, Mass.

Mother Nature's Lessons of Thrift

By T. D. MacGregor

TO THE observant man, Nature teaches many lessons of thrift—thrift in a broad, constructive, permanent way. For example, think on these things:

Ages ago before it was possible for man to live on this earth Nature had already begun to save for his coming. Gradually and patiently she collected in her treasure houses huge deposits of vegetable matter, which by the pressure exerted through ages was transformed into coal. Thus the sunlight of prehistoric times was not wasted, but shines again in the fireplaces, the blast furnaces and powerhouses of today. Coal is of inestimable value to man, not only as a fuel for domestic use, but for the reduction of metals and for all purposes of the arts, including the generation of steam and electric power, on which so much now depends.

* * *

Niagara—a huge, foam-tossed torrent of water, a world wonder, and the source of power for a territory which is an empire in extent and in resources—owes its enormous volume to the gradual accumulation of individual drops of water over the vast area comprising the watershed of the upper Great Lakes. The thrift analogy is obvious. There are many other natural reservoirs of waterpower which man is just beginning to use.

Then there is the glacier, formed of innumerable flakes of snow falling, falling almost continuously, then compacted by pressure into ice. This mass of ice has its origin in the hollows of mountains where perpetual snow accumulates; it moves slowly from higher to lower levels, making its way—a river of ice—towards the lower valleys, where it gradually melts and makes its great contribution to the fertility of the land and the power-producing possibilities of the waterfalls.

* * *

Endlessly pounding through the ages, slowly the ocean powders the shores on which it beats in surf, hollowing out caves in cliffs, wearing down mighty rocks and pulverizing into tiny grains of sand all things within its reach. Sand is found chiefly on the seashore, whence it is often blown inland. Rivers also deposit sand where the current is slack, and thus deposits of sand occur on alluvial flats and in the bends and estuaries of rivers. The sand thus patiently accumulated by Nature through the centuries is used by man for glass-making, polishing and scouring, in the preparation of foundry molds, as a cutting and etching agent, and for making mortar and cement. Alluvial deposits of rivers are not always sand. Sometimes, as in the case of the Mississippi, the deposits are of a fertile nature which form a rich delta.

We hear a great deal about oil nowadays. It is of national and international importance. Since the invention of the internal-combustion engine and the perfection of the automobile, oil has become one of the most valuable and important products of the earth. Thrifty old Nature again. Little by little in the deep recesses of the earth down through the ages she has been distilling the various mineral, vegetable and animal elements that go to make that precious fluid, oil, so indispensable to our present-day civilization.

* * *

"Go to the ant, thou sluggard; consider her ways, and be wise;

"Which having no guide, overseer, or ruler,

"Provideth her meat in the summer, and gathereth her food in the harvest," said Solomon, and his advice was good not only as regards ants but could also apply to that higher form of insect in the order Hymenoptera—the bee, whose thrift is so proverbial that many savings banks make use of the bee-hive as a fit symbol for the industry and saving for which they stand.

* * *

The beaver, like some other rodents, is another example of capitalism in nature. It lays up stores of provisions for winter, consisting chiefly of bark, or of branches, or even trunks of trees. These winter supplies of the beavers are kept under water at such a depth that they cannot be frozen up. So, coupled with his extraordinary building instincts as shown in his lodges and dams, the beaver has an instinct of thrift that leads him to prepare for the future.

* * *

Some squirrels of temperate and cold climates lay up stores for winter. These winter hoards contain nuts, grain, seeds of firs, and the like. They are usually kept in holes in the ground about the roots of trees, not far from the ordinary abode of the animal, the same pair of squirrels often having a number of these hoards.

* * *

So one could go on almost indefinitely, thinking of the sap in the trees, of the leaves that fall season after season for centuries to form the rich mold; of the legumes that draw the fertilizing nitrogen from the air; of the birds that thriftily build their nests in the trees and of the bear that saves up his fat to enable him to hibernate in the hollow trunk. Nature is essentially thrifty. And she is never discouraged. Even when fire, or flood, or ice, wreak temporary destruction, she patiently takes up again the task of restoration, which is slow but sure.

And so the thrifty man retrives his fortunes after a blow which would overwhelm a less determined individual.

CATCHING DRINKING WATER IN BERMUDA

By Percival Sheldon Ridsdale

HOW DO the twenty-five thousand people of the Bermuda Islands get drinking water? The natural inference is that they get it from streams, springs, or wells. But there are no streams in Bermuda, neither are there any springs, and the wells give only a brackish water unfit for drinking. This has always been the case in the Bermudas, which have been settled for several hundred years, where twenty-five thousand people live comfortably and where many thousands of visitors go every year. Most of these visitors learn with amazement that all of the drinking water has to be either caught or imported, and they are still further surprised to learn that fresh water is a commercial commodity which is sold to visiting ships at so much per ton.

A COMMERCIAL "CATCH"

Rain water caught on this hillside at St. Georges, Bermuda, is sold for from $4 to $8 a ton.

The visitor notes great white patches on the hillsides. At a distance, these look like large fields covered with some white fertilizer. Close at hand they prove to be large areas of cement-covered rocks. These are known as "catches." They catch rain water and drain it into large cisterns. These catches are owned by towns and villages and some of them by merchants who sell water to visiting ships. They are not difficult to make on account of the geological condition of the islands which are formed of a limestone rock. The soil on this rock is only a few inches deep. In making the catches, some of which are several acres in extent, it is only necessary to scrape off the thin layer of soil and expose the limestone. The limestone is then covered with cement to prevent it rotting. The cisterns are constructed at the lower edges of the catches. The rain water falling on the exposed surface is saved, runs down hill, and fills the cisterns, from which it is pumped for its many uses.

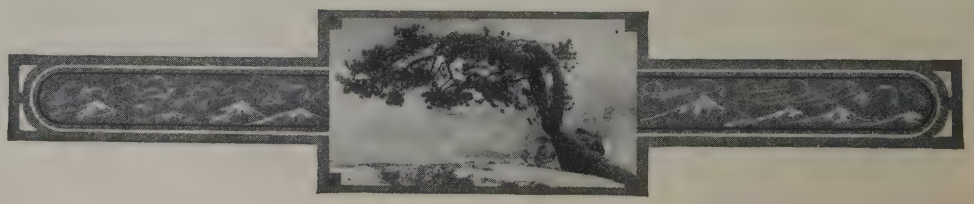
THE HOUSEHOLD RESERVOIR

Residents of Bermuda get their drinking water by way of the roofs of their houses which drain into cisterns.

In addition to these cisterns, each house has a rain-catching device of its own. This is the roof, which is made of the limestone rock, so readily cut from the numerous limestone quarries, covered with cement as are the catches and drained as other roofs drain, into troughs, which troughs, however, lead the water into cisterns attached to each house.

Fortunately the rainfall, as in other semi-tropical countries, is usually plentiful enough to supply all the needs of the people. Occasionally, however, there is, not perhaps an actual famine of fresh water, but actual lack of a sufficient quantity for the ordinary domestic purposes. Usually only the hotels are affected by such a scarcity, and when it occurs, water is imported from the United States in lots of several hundred tons for each shipment and the shipping costs are, of course, a very considerable item.

When water is sold by the water merchant the price ranges from four to eight dollars a ton. Water for other purposes than drinking is readily obtained from wells, but this is somewhat brackish, it being the salt water which filters through the rock foundation of the island.



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Ornithologists Meet

The forty-third stated meeting of the American Ornithologists' Union, an organization which has had a most profound influence on the progress of ornithology and the allied sciences, both in this country and abroad, was held in the halls of the American Museum of Natural History, New York City, on November 9 to 12 inclusive. Founded in 1883 by a band of 23 enthusiastic bird students, the Union has grown with the years until it now has a total enrollment of over 1,700. Its present membership includes men and women from every state in the country, in most of the provinces of Canada, and in a number of countries in South America, the West Indies, Europe, Asia, Africa, and Australia. *The Auk*, the official organ of the Union, which has just completed its 42d volume, has long been rated among the foremost of the ornithological serials of the world.

Following a business meeting held on the evening of November 9, the public sessions began the next morning with an address of welcome given by Henry Fairfield Osborn, President of the American Museum, who at its conclusion unveiled the bust of and memorial tablet to Daniel Giraud Elliot, a founder, and the second President of the Union, who died in 1915. The opening meeting was held in a hall dedicated to the memory of this eminent scholar, a special feature of which is an arched ceiling representing the firmament from which are suspended by invisible wires mounted specimens of a number of the more notable birds possessing sustained powers of flight, some of which are further represented by skilfully painted figures which seem to be winging their way amid the clouds of the upper air.

The list of papers presented at the meetings included communications from many prominent ornithologists, mainly American, but including one notable paper from Sweden. A large collection of paintings and drawings of birds, exhibited especially for the occasion by the foremost bird artists of the country, occupied a prominent position throughout the sessions, and attracted much attention. Other notable features, arranged for by the entertainment committee, included a special tour of the New York Zoological Park, with its almost unexampled collections, a field trip to Long Beach, Long Island, where a considerable party were able to observe the Ipswich

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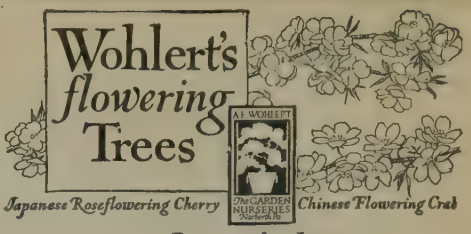

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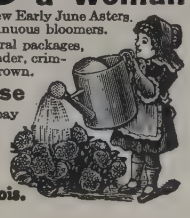

Charlotte M. Haines
Dept. 75 , Rockford, Illinois.

sparrow, one of the rarest of our eastern birds, besides many species of lesser interest, and a special conducted tour of the plant of the *New York Times* where the methods of making a great newspaper were fully explained. The Union voted to hold its next meeting in Ottawa, Canada.

To Ernest Baynes

Ernest Harold Baynes has passed to that undiscovered bourne from which no traveler returns. But his works live after him. Lying peacefully in the shadows of the mountains he loved at Meriden, New Hampshire, is the bird sanctuary that this lover of the birds created. The Meriden Bird Club is now moving to perpetuate this sanctuary as a memorial to Mr. Baynes. Nothing could be more fitting, and followers of Mr. Baynes and bird lovers will find it an opportunity to express their sentiment. The Rev. Noble O. Bowlby of Meriden is president of the club and already unsolicited donations have been received. He will send details of the task that lies ahead in assuring this memorial to all who may inquire.

Heath Hens Seen

Edward F. McLeod, warden at the Heath Hen Reservation at Martha's Vineyard, Massachusetts, reports that eighteen heath hens, remnants of the decreasing race, have been seen. He reports that twelve birds were in one flock together. This news permits the hope to arise that there can be a check to the threatened extinction of these birds, and that slowly their numbers may increase as a result of the fine and painstaking work of preservation that is being carried on.

National Monuments

Creation of a commission representative of the several government departments concerned to act upon applications for the setting aside of points of historic or scientific importance as National Monuments, is urged by Robert Sterling Yard of the National Parks Association in a report to the National Conference on Outdoor Recreation. Mr. Yard emphasizes the need of creating a system under which the monuments would be established and administered. He points out that there is a tendency toward using political persuasion and inspiration in this direction and that a definite policy is needed.

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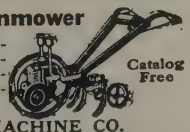

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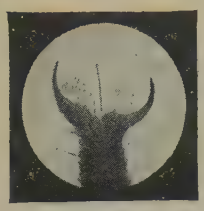

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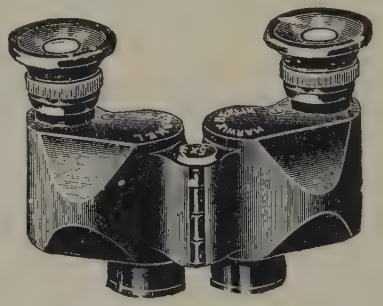

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Add Spider Stories

Mr. Martin J. Arvin of Loogootee, Indiana, adds the following to the stories about the entangling properties of spider's webs:

"While sweeping the kitchen my sister noticed a half-grown mouse caught in a spider's web constructed behind the leg of the range stove. Whatever had been the manner of entangling the mouse, the spider had succeeded in holding it by means of a score of strands wrapped about its tail, and the whole web had been more effectually anchored to the floor and to the body of the stove. When my attention was called to it, the mouse was suspended at an angle of forty-five degrees, and was desperately scraping the linoleum covering of the floor with its forefeet. It was at once apparent that the struggle was futile.

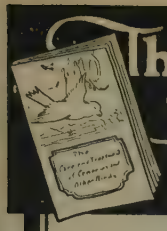
"The spider tried several times to hoist its catch above the floor by drawing a strand around the mouse's head and neck, but each time the game little animal broke the strand by a paw with one of its forefeet. Then the spider took a position at the base of the mouse's tail where the skin was tender, and evidently sunk its mandibles into the victim, which was noticed to flinch several times. This was early in the morning and at four in the afternoon the mouse had been lifted into the web to a height of an inch above the floor and was dead. The next morning the spider had raised its victim three-quarters of an inch higher."

Seeks Bird Data

As a part of its work of keeping a check on conditions among the birds in the United States, the United States Bureau of Biological Survey frequently sends out questionnaires covering one or more species. The Bureau is now seeking information on the woodcock, Wilson snipe or jack-snipe, golden plover, lesser yellowlegs, black-bellied plover, greater yellowlegs and sora rail. The data desired covers notation of any increases or decreases in numbers during the last three years; whether the birds breed in the vicinity or are migrant; changes in conditions relating to breeding; whether the last three years have been favorable for breeding; how many birds observed in 1925 compared with previous years; whether there are sufficient numbers to allow shooting, and whether a closed season should be maintained for a period of years. Other relevant information is desired.

Moose Photographs

Credit for the authorship of the moose picture, page 347, December issue, should be given to Dr. Charles M. Whitney of Boston, Mass.



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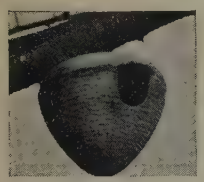

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Rays on the Ray

Mr. Harry Belknap of Boston calls attention to an error in the November issue of NATURE MAGAZINE in calling the peculiar looking fish on page 277 a "sting ray." It was, in reality, a relative known as the spotted whip ray. Mr. Belknap points out that "the sting ray is gray in coloring above the white underneath, while the whip ray is black with the white circles or spots. The whip ray has a different head from the sting ray, the latter having its eyes on top of the body and mouth on under side similar to a skate. A sting ray has one spike on its tail while the whip ray has three of these spines and its tail is long and whip-like, being four to five times the length of the sting ray's tail." In the third of Captain Menander's fish articles, published in this issue, will be found a photograph of the sting ray.

An Agile Snake

"While driving this summer a few miles out of Council Bluffs, Iowa, along a highway cut through clay hills, I noticed a peculiar spectacle," writes Dr. Raymond C. Olson of Minneapolis. "The cuts through these hills, I should judge, were at least forty or fifty feet deep, being almost perpendicular on either side of the road. The banks were devoid of growth. Covering them, however, at intervals of six to twelve inches, were holes or nests that I presume were made by swallows. Half way up this perpendicular bank, twenty feet from the ground and about the same distance from the top, I noticed a snake. It was the sort commonly called a bull snake. It was about four feet long and had its head in one of the nest holes and its tail in another, apparently feeding on eggs. Attempts to dislodge him were to no avail and he would only draw out his head, look around, and then bury it deeper than ever."

Sportsman and Gunner

Commenting on a newspaper paragraph listing the open seasons on various game birds and including woodpeckers in the list that "sportsmen may take," the Houston *Zephyr* puts a distinction very aptly. The publication of the Outdoor Nature Club of this Texas city points out the value of woodpeckers—save for the sapsuckers—and adds that "we hereby assert our opinion that the wording of that statement should be 'gunners may take woodpeckers.' A sportsman is never guilty of useless, wanton slaughter."

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Red-winged Blackbird
Bluebird
Bobolink
Catbird
Cedar Bird
Chickadee
Purple Finch
Flicker
Goldfinch
Ruby-throated Humming-Bird
Blue Jay
Kingbird
Baltimore Oriole
Golden-crowned Kinglet
Robin
Chipping Sparrow
Song Sparrow
Barn Swallow
Chimney Swift
Scarlet Tanager
Wood Thrush
Red-eyed Vireo
Black and White Warbler
Yellow Warbler
Downy Woodpecker
House Wren

NUMBER TWO

Twenty-six Common Birds
(In Color)
Drawn by EDWARD KNOBEL
under the direction of RALPH HOFFMANN
The Birds pictured are as follows:

Indigo Bunting
Cardinal
Cowbird
Yellow-billed Cuckoo
Least Flycatcher
Bronzed Grackle
Rose-breasted Grosbeak
Meadowlark
White-bellied Nuthatch
Ovenbird
Wood Pewee
Phoebe
Redstart
Vesper Sparrow
Tree Swallow
Brown Thrasher
Wilson's Thrush
Towhee
Warbling Vireo
Yellow-throated Vireo
Black-throated Green Warbler
Chestnut-sided Warbler
Pine Warbler
Whip-poor-will
Red-headed Woodpecker
Maryland Yellow-throat

NUMBER THREE

Twenty Winter Birds
(In Color)
Drawn by LOUIS AGASSIZ FUERTES
The Birds pictured are as follows:

Bob-white
Brown Creeper
Goldfinch, winter plumage
Prairie Horned Lark
Myrtle Warbler, winter plumage
Northern Shrike
Pine Siskin
Pine Grosbeak, male and female
Purple Finch, female
Redpoll
Red-breasted Nuthatch
Red Crossbill, male and female
Ruffed Grouse
Slate-colored Junco
Snow Bunting
Tree Sparrow
White-winged Crossbill, male and female

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Women's Clubs Active

Steady increase in the number of clubs of the General Federation of Women's Clubs that are taking up tree planting is reported by Mrs. Francis E. Whitley, chairman of the Division of Conservation of the Committee on Forestry and Wild Life Refuges of the Federation. Mrs. Whitley points out that this tendency must inevitably help to turn the attention of the people to forestry. She also reports excellent results as a result of her Outdoor Good Manners campaign, as a part of which reprints of the two pages of outdoor cartoons from NATURE MAGAZINE of last July were used with marked educational effect.

At Augustana College

This institution at Rock Island, Illinois, boasts something unique in the way of outdoor organizations in the Roosevelt Outing Club. It was organized two years ago and has grown rapidly to a membership of about seventy-five, including several faculty members. Its difference lies in the practical application of its ideals, namely, the beautification of the campus of the college by bringing Nature to it in every way that it is possible. The work is financed by the students and is going forward with zeal and discretion. The importance of such constructive thoughts and acts in our colleges and secondary schools cannot be too greatly emphasized, for it is upon the citizenship that leads that we must depend if we are to have any resources in Nature in the future.

Distinct Progress

With an increase of thirteen to a total of thirty-two, the Federation of the Bird Clubs of New England is becoming an even more potent factor in the wild life conservation. Its annual report for 1925 lists several outstanding accomplishments. By legislation, purchase or gift it has had set aside eight islands along the Massachusetts coast for the breeding of terns, gulls and herons; has financed the protection of six tern colonies; has employed a special warden for the heath hen reservation; has attempted public education to check the abandoning of house cats, which, hungry, prey upon the birds; and has obtained title to a sanctuary in Ashby, Massachusetts. The heath hen committee reported on its last ditch struggle to exterminate predatory enemies of the bird and to endeavor to save the few remaining birds. The sanctuary committee reported signal progress in this work.

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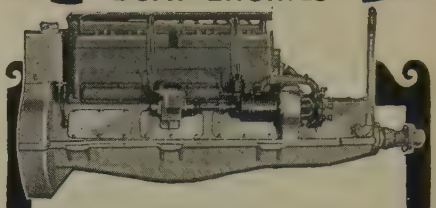

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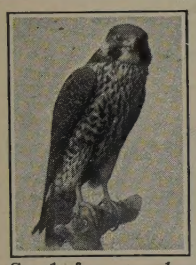

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Questions and Answers

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QUESTION: *Will you please advise me whether deer shed their antlers close to the head or whether just the outer covering comes off?*—G. C.

ANSWER: The horns of all the deer tribe, represented in North America by the deer, moose, elk and caribou, drop their antlers in the winter or spring of each year, the horns separating close to the head. Within a few weeks new horns spring from the same place, gradually branching and enlarging. These are soft and spongy, with a furry skin called the velvet, which is scraped off by the animals when the horns become hard.

QUESTION: *Can you advise me about the raising of moth and butterfly eggs?*—G. C.

ANSWER: No general statement can be made regarding the raising of butterflies and moths from eggs. Some eggs will hatch in three days while others will not hatch for at least ten months. Some will not hatch if they get chilled and others will not hatch unless they are frozen for a considerable time. It is difficult to get most butterflies to lay eggs in confinement, even if the right food plant is provided. Moths, as a rule, are easier to handle and all our very large moths, like the *Cecropia, Luna* and *Polyphemus,* are very easy to raise. They readily lay eggs in captivity on the sides of the boxes they are in or elsewhere, and the little caterpillars when they hatch can readily be transferred with a feather to any one of the somewhat long list of food plants.

QUESTION: *What insect is it that is called the "death watch"?*—G. E. C.

ANSWER: The sound called the "death watch" is usually made by small beetles of the genus *Anobium* which bore holes in furniture and other wood. The sound is produced by the beetle bobbing its head up and down and tapping the wood. *Atropos pulsatoria,* also known as the "bark louse" and "book louse," is also referred to as the "death watch."

QUESTION: *How does the fish control the amount of air in its air bladder?*—M. E.

ANSWER: The gas in the air bladder of fishes is secreted by its inner surface, and its volume, and therefore its sustaining power, is controlled by pressure exerted at will by the fish. In most fishes the organ serves only to alter the specific gravity of the fish, but in a few groups it assumes the function of a lung.

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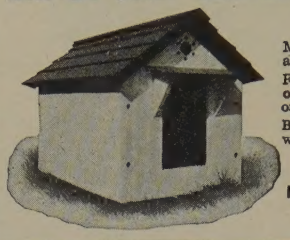

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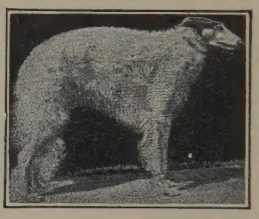

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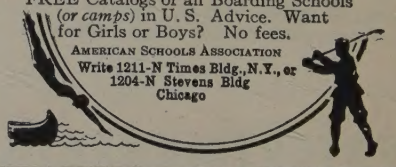

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THE TREE PLANTING ARMY

PLANS FOR 1926 POINT TO A BIG YEAR AS IT MARKS SEMI-CENTENNIAL OF FORESTRY IN UNITED STATES

The year 1926 promises to be a big one for the tree planters. The American Tree Association calls on the tree-planting army to plant semi-centennial trees. These trees will mark the semi-centennial of the first step in forestry by the United States Government, for in 1876 the first appropriation was made to provide for looking into the subject.

"What will the next fifty years show?" asks Charles Lathrop Pack, the president of the Association, "when in 1976 the citizens of the United States look back on the progress made toward the education of the public of the importance of a timber crop every year?"

The fall season just closed has shown a remarkable activity in the educational work being carried on by the American Tree Association. The town forest idea is being studied in thousands of places. The Association has sent out thousands of pieces of printed matter in this campaign to women's clubs and similar organizations.

One of the first campaigns for the year will be that of the Daughters of the American Revolution in Iowa. The state meeting is in March. Mrs. Cyrus Wolf is the chairman of conservation. Many of the chapters will present a playlet by Mrs. L. B. Schmidt, and this will be followed by tree planting by every chapter and registration in the tree-planting army. Mrs. Frederick E. Frisbie, the national chairman of conservation, hopes to have a tree planted by every chapter.

The Division of Conservation of the Iowa Federation of Women's Clubs of which Mrs. H. S. Vincent of Fort Dodge is chairman, is asking every federated club woman to plant at least one tree before May 1. The idea which they are sponsoring is not to take a tree from one place and put it in another and call it "Planting a tree" but to plant a new tree. However, if a seedling is given proper care so that it becomes a good tree, which otherwise would be wasted, that may count as a tree. Transplant it and count it as your tree. What the Division of Conservation hopes to do in its program is to secure more trees for Iowa and thus give generously to the future generations. Forty thousand trees planted by May 1, 1926, is their ambition, for Iowa has 40,000 federated club women who should be interested in planting at least one tree during the year. "We hope," said Mrs. Vincent, "to interest club husbands, club sons and daughters in the campaign so that they will boost our tree planting."

Boy Scouts of Newark, Ohio, journeyed to the Scout Reservation where they received their first practical lesson in conservation in the planting of 1,500 of the 2,000 trees of tulip poplar, red and white oak species furnished by the Ohio state nurseries of Chillicothe.

Twenty-two acres of land belonging to Sacred Heart Slovak Church of Wilkes-Barre, will be planted in forest trees during April. More than 30,000 trees will be required to plant this area, according to District Forester Brouse, who inspected the land. The trees will be supplied by the Pennsylvania Department of Forests and Waters. A tract of forty acres was purchased by the church about two years ago and plans for its development are now under way. Twenty acres are set aside for the establishment of a forest, five acres for park and playground purposes. Rev. Father Murgas and Richard C. Chladek who was projecting the work are immensely interested and can see no reason why in Pennsylvania there cannot be profitable church and town forests such as those in their native country.

The Adolph Lewishon Douglas fir has been planted at Wellesley and dedicated by Mrs. Walter S. Mach, Jr., '20, his granddaughter. The tree stands about halfway between Tower Court Hill and Rhododendron Hollow.

Mrs. E. C. Whitmeyer of the New York State Federation reports fifteen thousand trees were planted this fall at the Federation Forest and that thirty thousand are to be planted this spring on the reservation between Saratoga and South Glens Falls.

At the state meeting of the federation of Wisconsin Mrs. Walter Bowman put the forestry and tree-planting campaign before the women in fine fashion. She distributed the Association's information to women representing every section of the state.

Through the Kentucky Federation of Women's Clubs a tree by every member during the club year is the target aimed at by Anne Gullion, the state chairman of conservation. Mrs. Allie Smith Dickson is the president of the Kentucky Federation. Each conservation chairman has been sent tree-planting army information by the Association.

At the direction of Mrs. Dale Hebrank the Argonia Society of Independence, Kansas, has taken up the study of forestry and the town forest idea.

In Ohio the federated clubs have a pretentious campaign on, as they handled the Davey Scholarship plan which has just closed. The Davey award is $4,000, representing $1,000 a year for four years to be used in attending an Ohio college or university. The forestry essays are now in the hands of the judges, and the announcement will be made on Arbor Day. The formal award will be made at the state convention of the federation in the spring.

The tree-planting army idea has been put before the state federation of Texas by Mrs. James F. Welder when the meeting was held at Austin. *Holland's Magazine* is conducting a big tree-planting campaign through the state schools.

A tree-planting program suggested by the Association was followed by the children of the Deaconess' Home in Philadelphia. The tree has been registered on the national honor roll.

The only way to join the American Tree Association is to plant a tree and register it with the Association, 1214 Sixteenth Street N.W., Washington, D. C. The Association will send tree-planting suggestions and a tree-day program for two cents to pay postage.

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